August, 1956
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Plastics

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Toughened polystrene
MOULDING POWDER

Mouldings in Bexoid Bextrene and B.C. 15 Toughened Polystyrene by Wells-Brimtoy Distributors Ltd.

BEXTRENE
Polystyrene MOULDING POWDER

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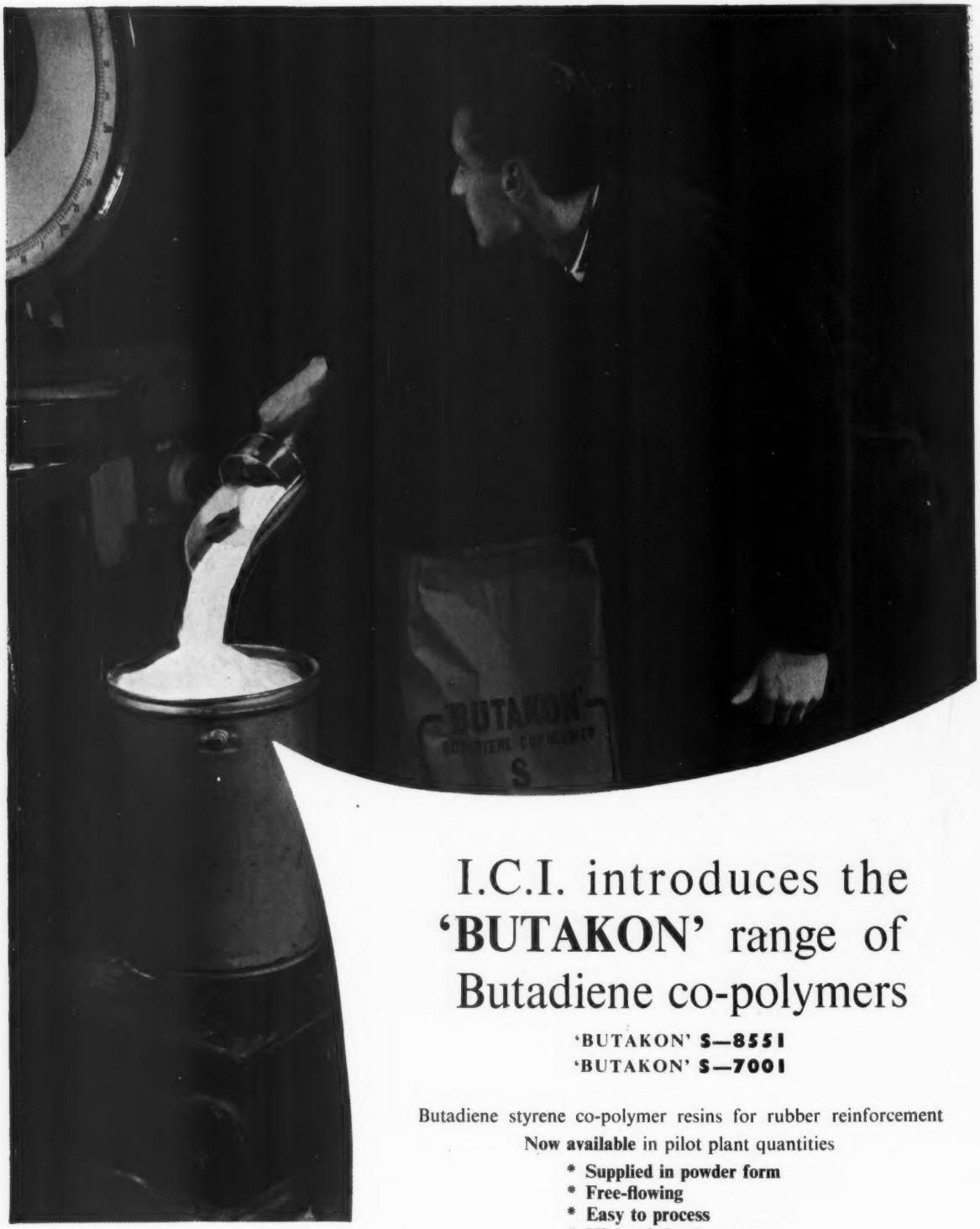
BX PLASTICS LIMITED Higham Station Avenue, London, E.4.
Subsidiary of the British Xylonite Company Limited.



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Butadiene styrene co-polymer resins for rubber reinforcement

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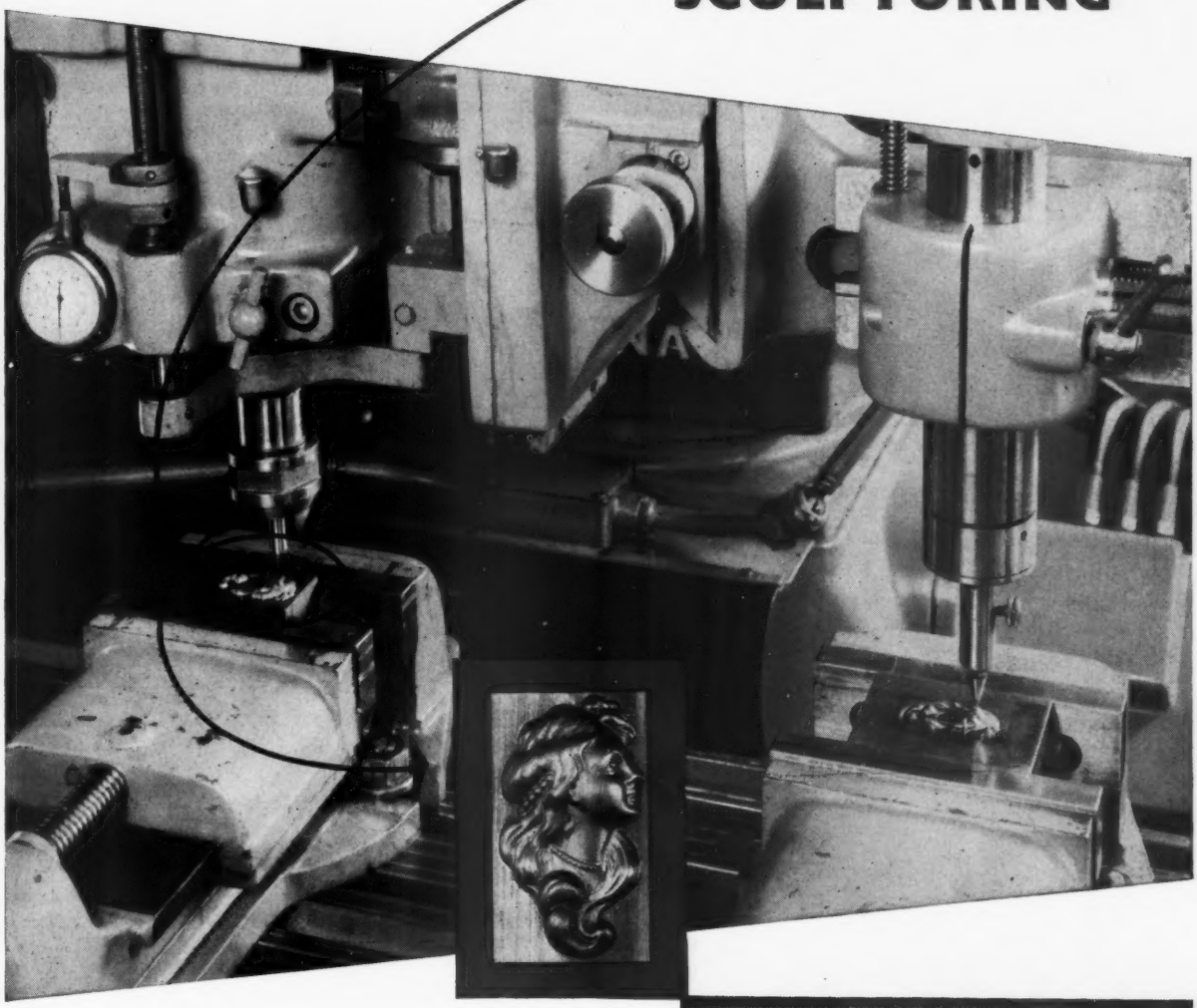
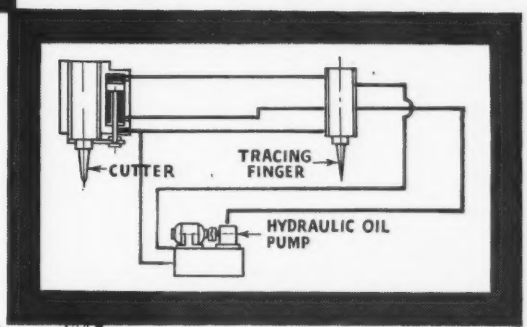


Sculpturing is slow, tedious work and a slight miscue can spoil weeks of painstaking labour. "Sculptors" of metal—diesinkers —can employ automatic tracing to produce minute details much faster and more accurately than could ever be done manually. **Cincinnati Tool and Die Millers** are equipped for the economic production of moulds, hobs and dies up to an area of 8″ × 18″ and they can also be fitted with duplex power-driven rotary tables, for making circular moulds. Catalogue M-1731-E will tell you more; why not send for a copy — NOW?



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Catalogues available from Charles Churchill & Co.'s offices in London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow or :— from Cincinnati Milling Machines Ltd., Birmingham 24.

A

Current Beecham Achievements

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Quoted from a letter written by a Director of Messrs. Haynes, Ford & Elliott Ltd.

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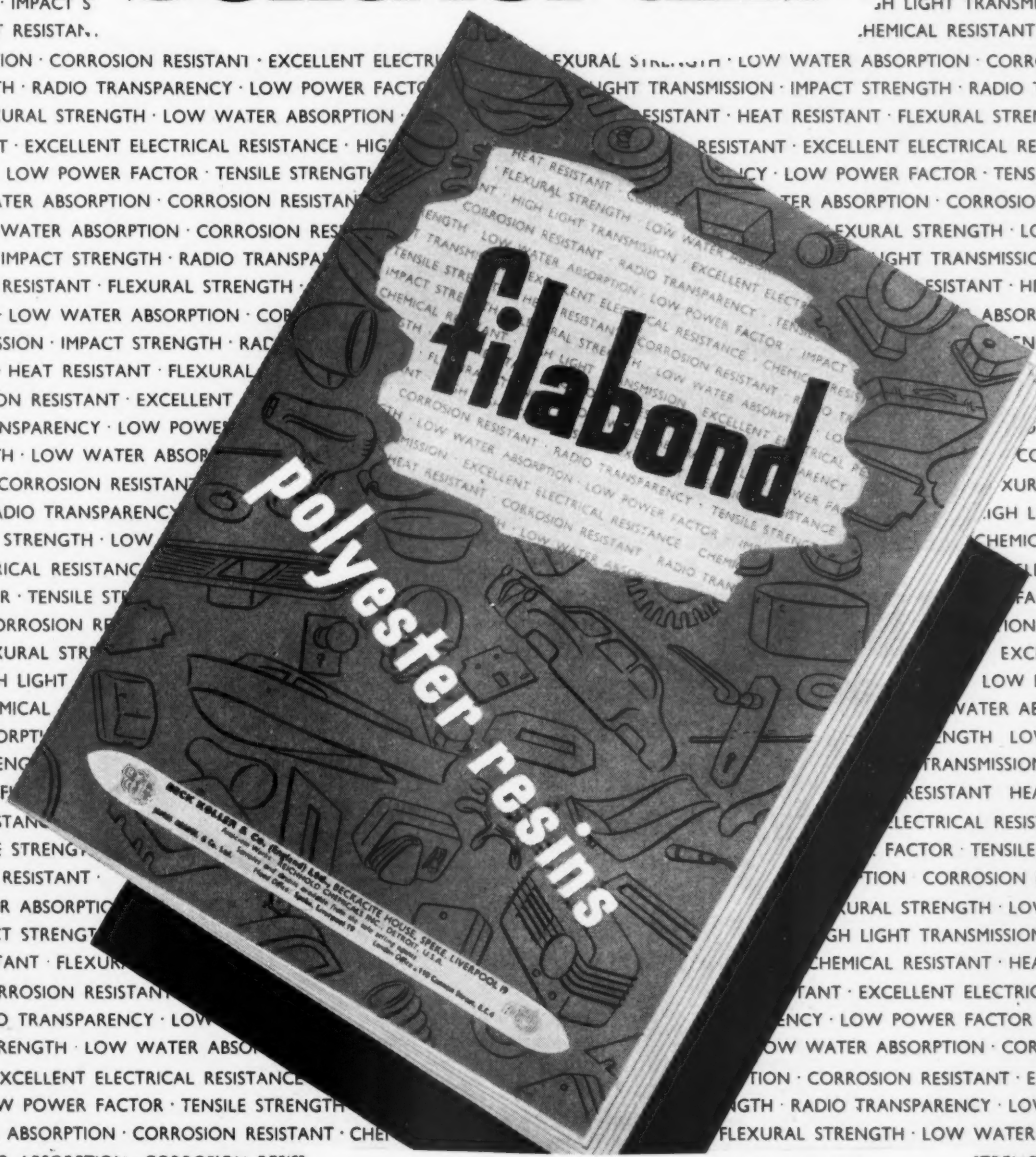

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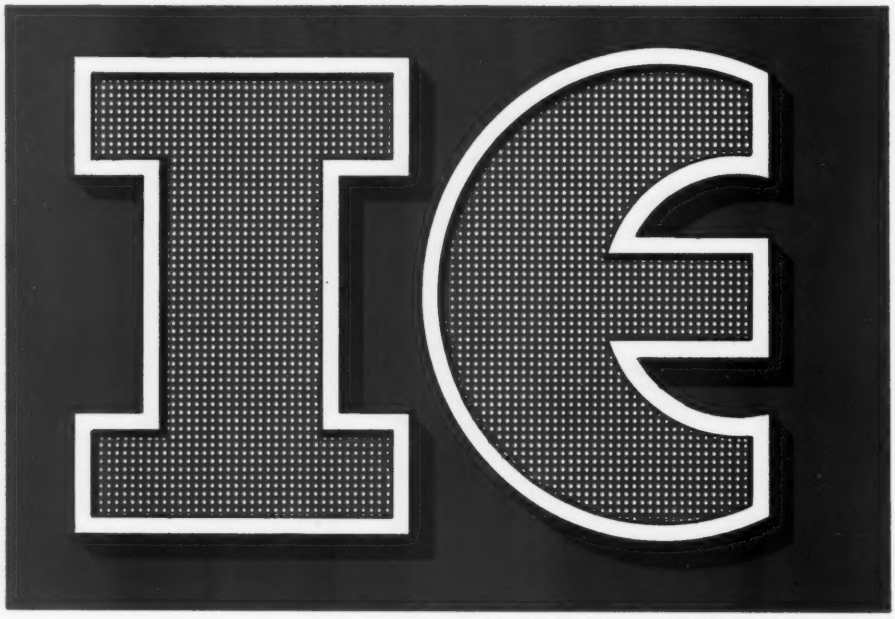

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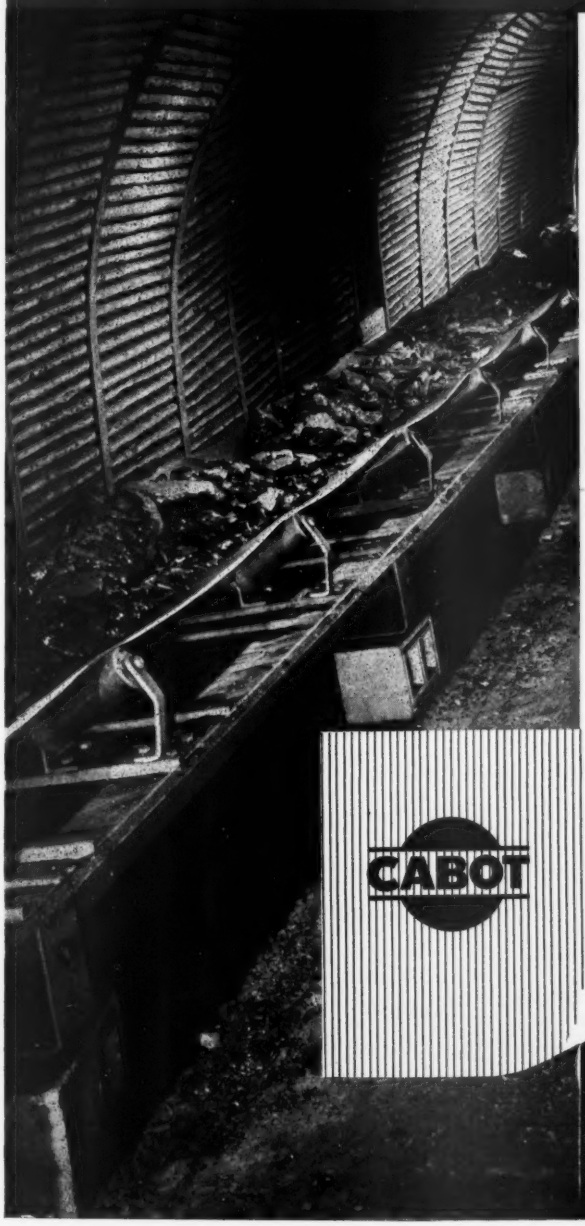

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All New HPM

BRITISH HPM BUILT

THE WORLD'S *MOST COMPLETE LINE* OF PLASTICS INJECTION MACHINES!

STANDARD INJECTION MACHINES				
MODEL NUMBER	150-H-6	300-H-12	400-H-20	800-H-48
Capacity (oz.–Single Feed)	6	12	20	48
Capacity (oz.–Double Feed)	8	16	28	64
Material Injected (cu. in. per min.)	440	1035	1330	2895
Plasticizing Capacity (lbs. per hour)	60	100	135	350
Mould Clamp Capacity (tons)	150	300	400	800
Mould Space (hor. × vert.):				
(a) Full Platen Vert.	10½″ × 25″	16½″ × 33″	20½″ × 42″	36″ × 54″
(b) Full Platen Hor.	20½″ × 15″	30″ × 20″	36″ × 26½″	54″ × 36″
Daylight Opening without Ram Spacer	20″	30″	40″	55″
Daylight Opening with Ram Spacer	16″	26″	34″	47″
Mould Thickness without Ram Spacer	10″	10″	15″	20″
Mould Thickness with Ram Spacer	6″	6″	9″	12″
Clamp Travel (max.)	10″	20″	25″	35″
Motor Horse-power	20	40	50	100
Shipping Weight (pounds)	14500	22000	39000	75000

NOTE: All ratings based on moulding general purpose polystyrene

From 6 ounces to 400 ounces; with mould clamping pressures from 150 tons to 3,000 tons . . . that's the scope of the new H.P.M. range.

Each machine is new, designed with many outstanding features. High capacity plasticizing chambers, weigh feeders, greater 'shot' capacities, increased daylight and stroke, quiet pumps, and sub-plate mounted valves reducing piping to the absolute minimum, are some of the reasons why H.P.M.'s mould better, faster and at lower cost.

They are famous for dependability too; designed by America's pioneer manufacturers of injection machines, each unit has 77 years' hydraulic machinery building experience behind it.

May we send you further details

Other H.P.M. Models are available with these capacities:—

STANDARD
Model 600-H-32 Capacity 32 ounces.
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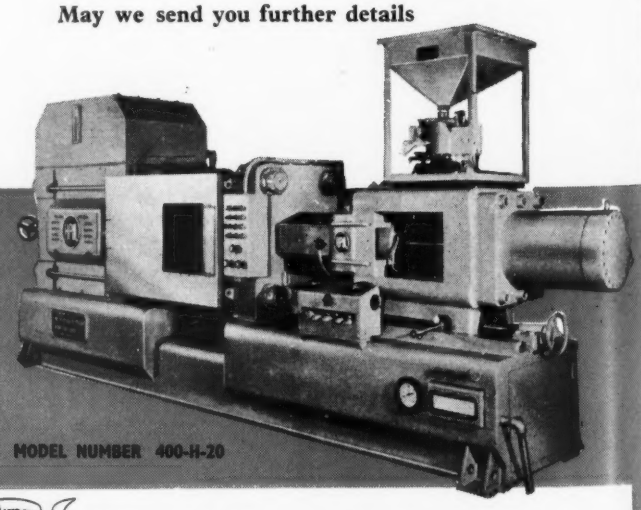
PRE-PLASTICIZING
Model 400-P48A Capacity 48 ounces.
„ 1200-P200 „ 200 „
„ 3000-P400A „ 400 „



MODEL NUMBER 400-H-20

WICKMAN LIMITED

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Telephone: Coventry 40351

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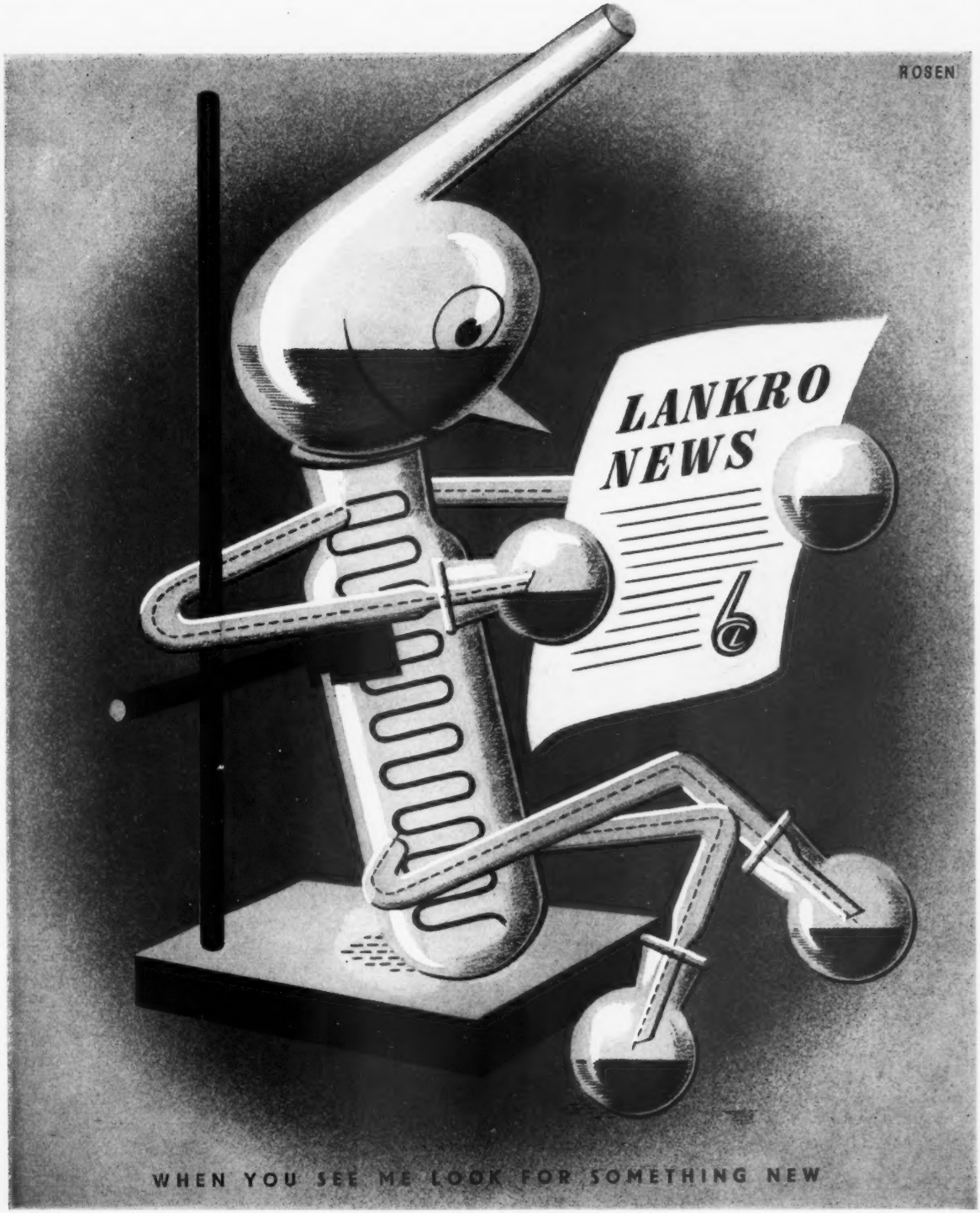

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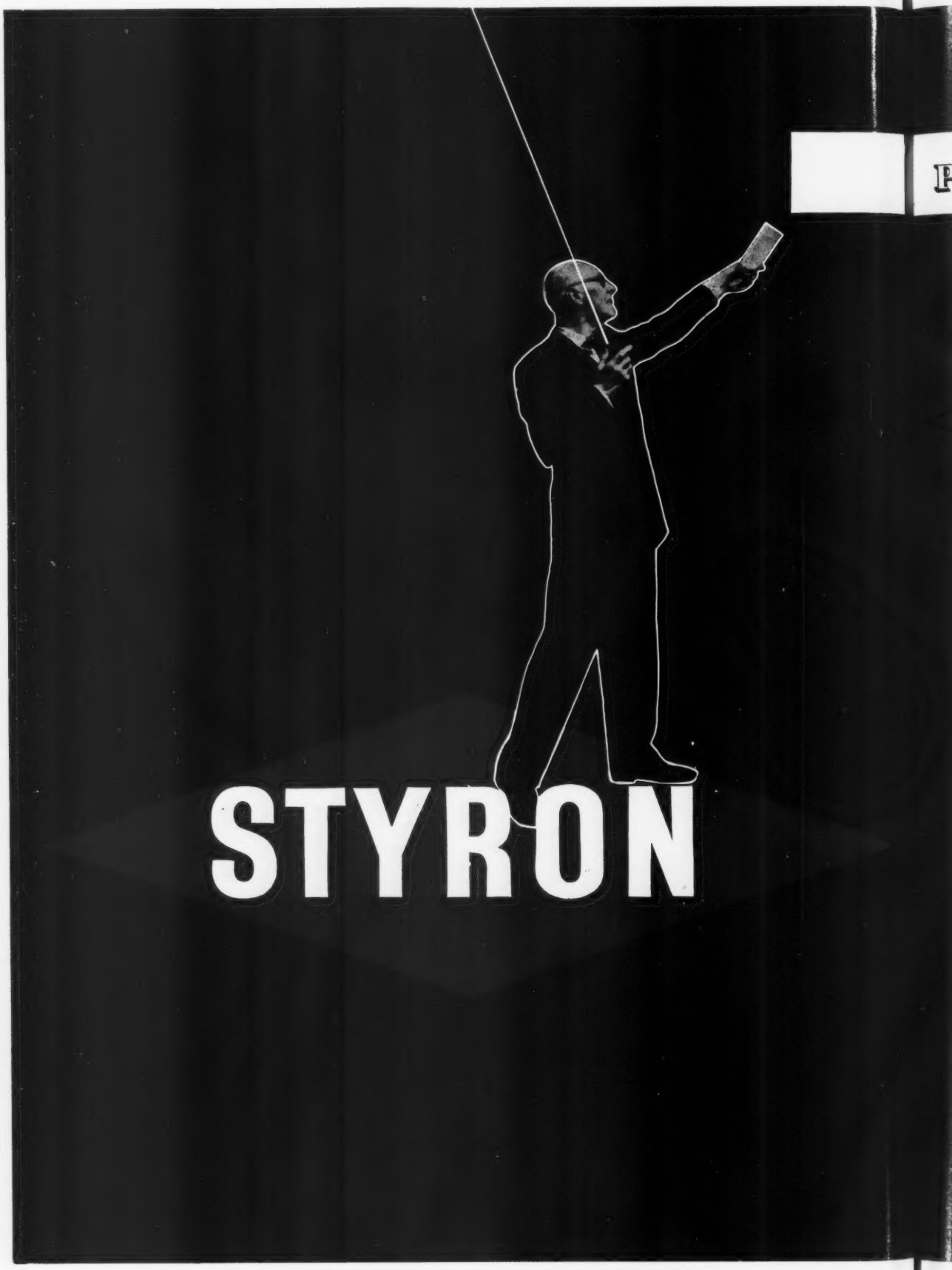
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M. & I. are suppliers of P.V.C. extrusions for a variety of purposes

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sleeving in a wide range of sizes, in many colours and several degrees of hardness, including heat resisting and clear translucent grades.

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P.V.C. sleeving covered with non-fraying cotton braid to support the plastic during close soldering operations and processed to resist fungus growths.

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plastic covered metal conduit for a number of uses such as protection of trailing cables in proximity to acids, gases and heavy condensations, as gas hose or suction hose, and as a protection for flexible leads and electrical connections on machine tools and motors.

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an improved extensible watertight expansion joint for use in concrete structures and particularly where water pressure is involved. A special patented cross section is employed to ensure effective bonding to the concrete.

"DURASEAL"

A watertight seal between adjacent sections of the concrete lining of tunnels.

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in insulating grades for covering bus-bars etc., or in non-insulating grades in a wide range of ornamental designs for carry-handles for portable radios and similar applications.

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P.V.C. thread for cable lacing, in diameters ranging from 0.75 m/m.

"KENUTUF" INJECTION MOULDINGS

in P.V.C. Cellulose Acetate, Polystyrene as well as other plastics.

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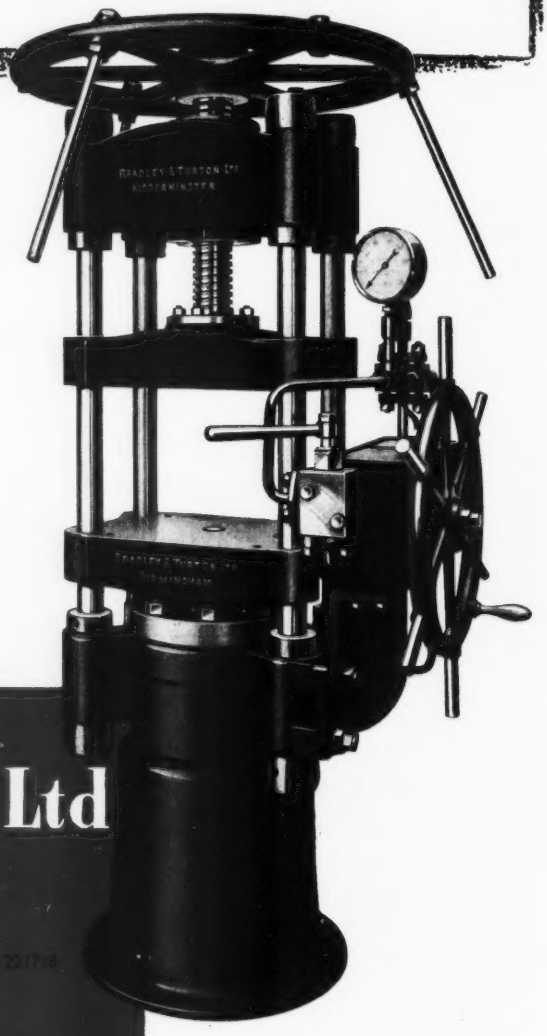
A machine which has been supplied to factories large and small and in many countries for a wide range of uses.



This Hand-operated Press is particularly useful in cases where a hydraulic main supply is not available and where it is desirable to commence moulding without the initial expenditure of a power pump. It is also a valuable machine for the laboratory, on experimental work and for mould testing.

The press is completely self-contained and the full load is easily applied by means of the pressure wheel.

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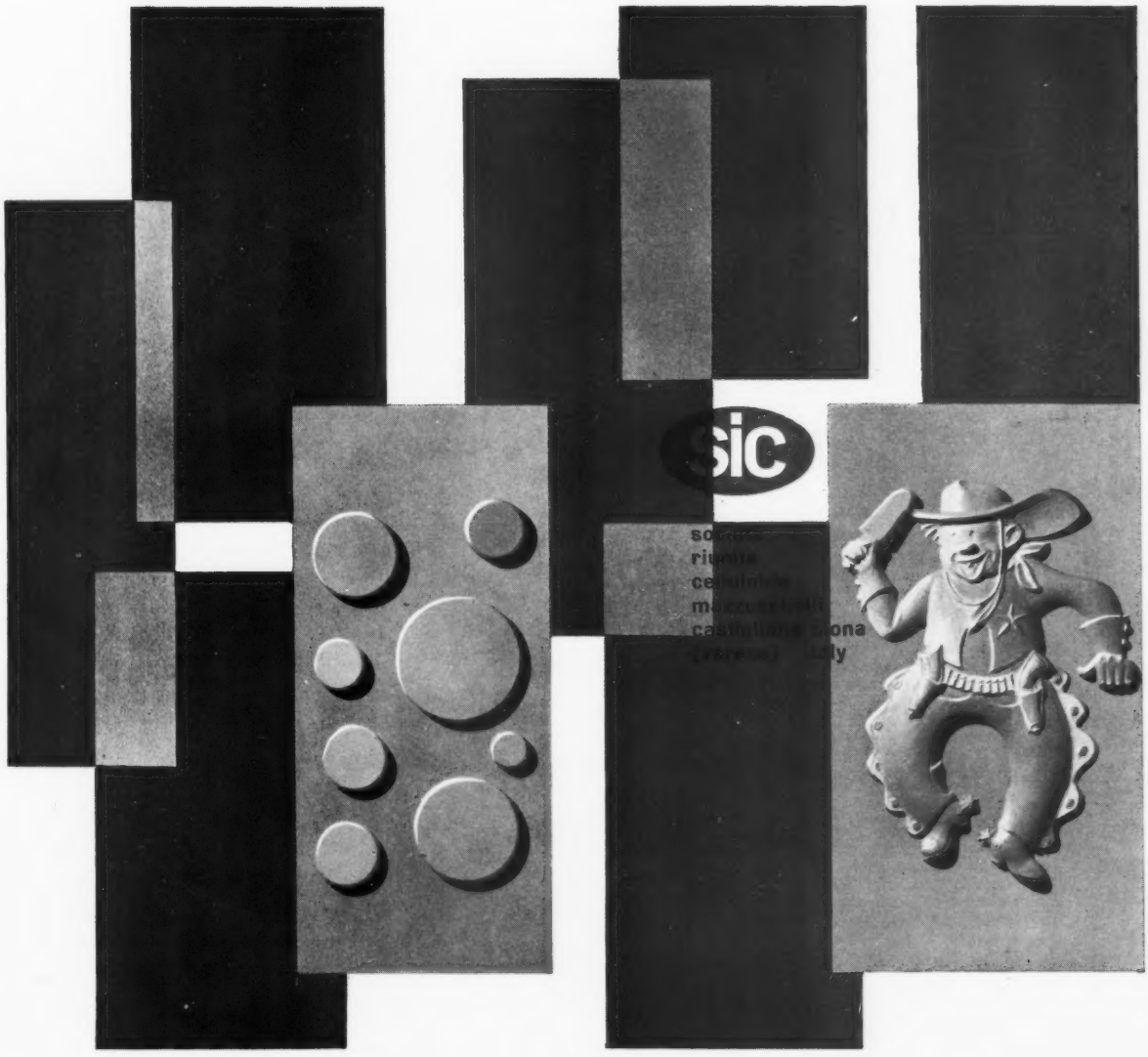
for easy moulding



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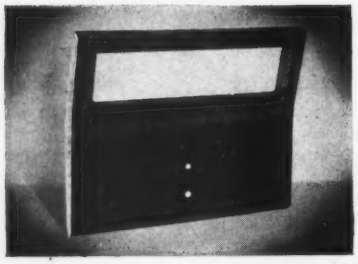

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" Sternite " general purpose grades are being used very extensively for the production of electrical accessories, where fast cure and low cost are of prime importance. Outstanding among grades for this class of work is " Sternite " SPF.205/515/5, special lamp holder material, possessing improved mechanical strength, low shrinkage and heat resistance.

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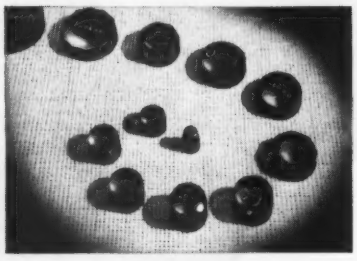

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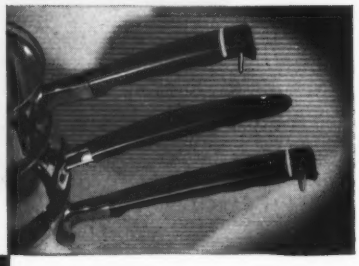

SAUCEPAN HANDLES for MIRROWARE
by Plastics (Wednesbury), Ltd.

S.16

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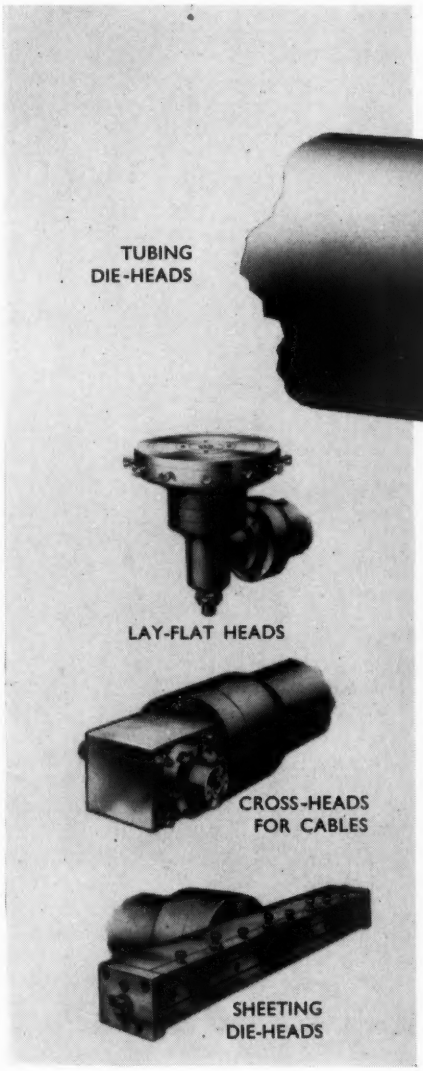

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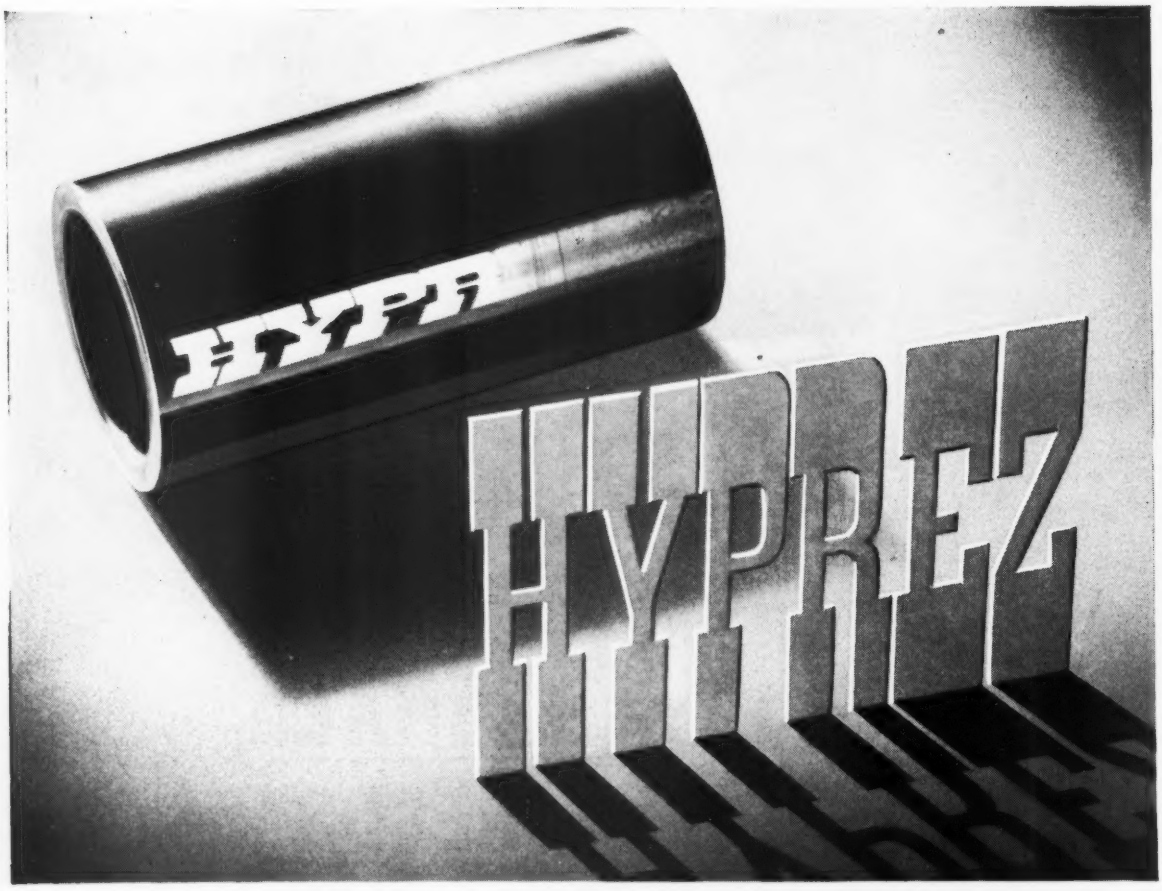
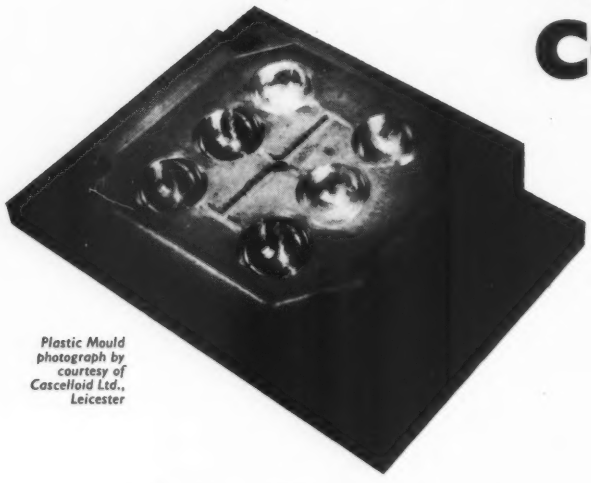


DIAMOND COMPOUND



Plastic Mould photograph by courtesy of Cascelloid Ltd., Leicester

imparts to plastic moulds a finish which is reflected in the product.

The illustration (left) shows a plastic mould part-finished with Hyprez, part-finished to a normal degree.

For full details, please apply to:

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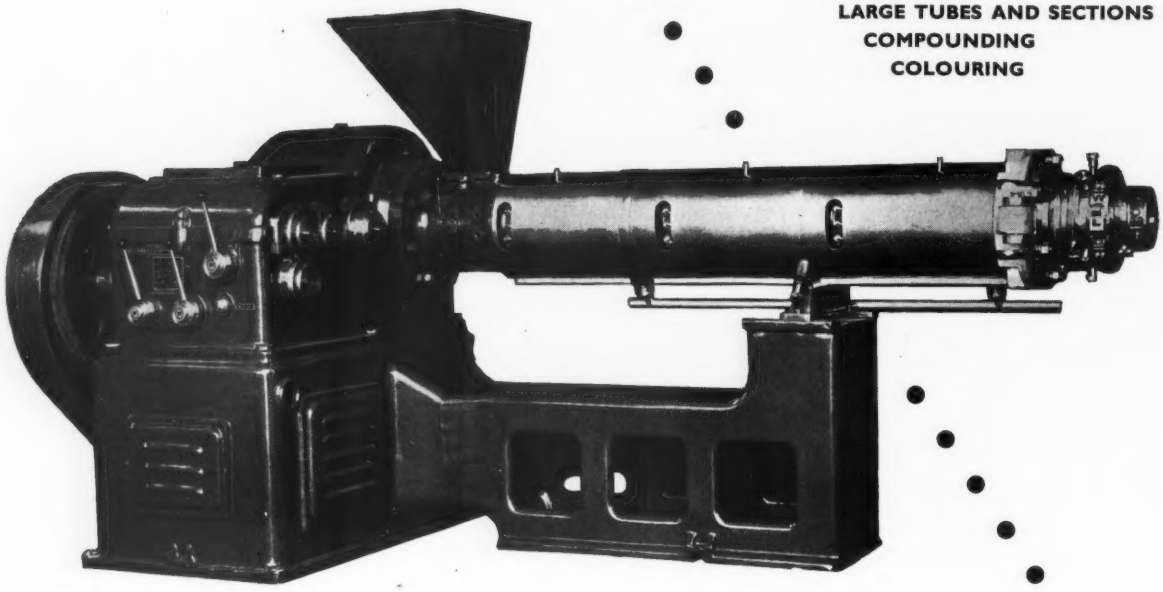

SPECIFICATIONS OF THE T.120 EXTRUDER (shown on photograph)

Long (17:1 and 20:1) 4¾" Screw of Chrome Metal Steel
5 Heating Zones
40 h.p. Motor
12 Speeds
Output 180 to 220 lb. per hour:

These machines are the lowest priced Extruders on the British market, and can be supplied complete with take-off equipment, for

Rigid Tubes
Polyethylene Lay-Flat Tubing
P.V.C. Lay-Flat Tubing
Cables

No. 3	1¼" dia. screw
T. 45	1¾" ,, ,,
T. 60	2½" ,, ,,
T. 70	2¾" ,, ,,
T. 80	3¼" ,, ,,
T. 100	4" ,, ,,
T. 120	4¾" ,, ,,
T. 160	6" ,, ,,

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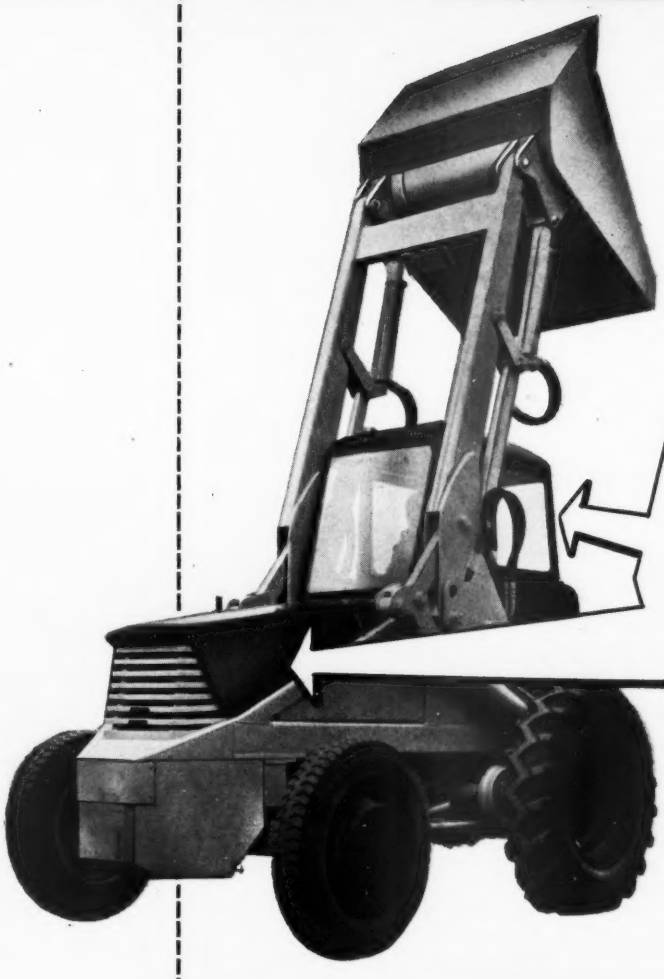

Dual Loader for
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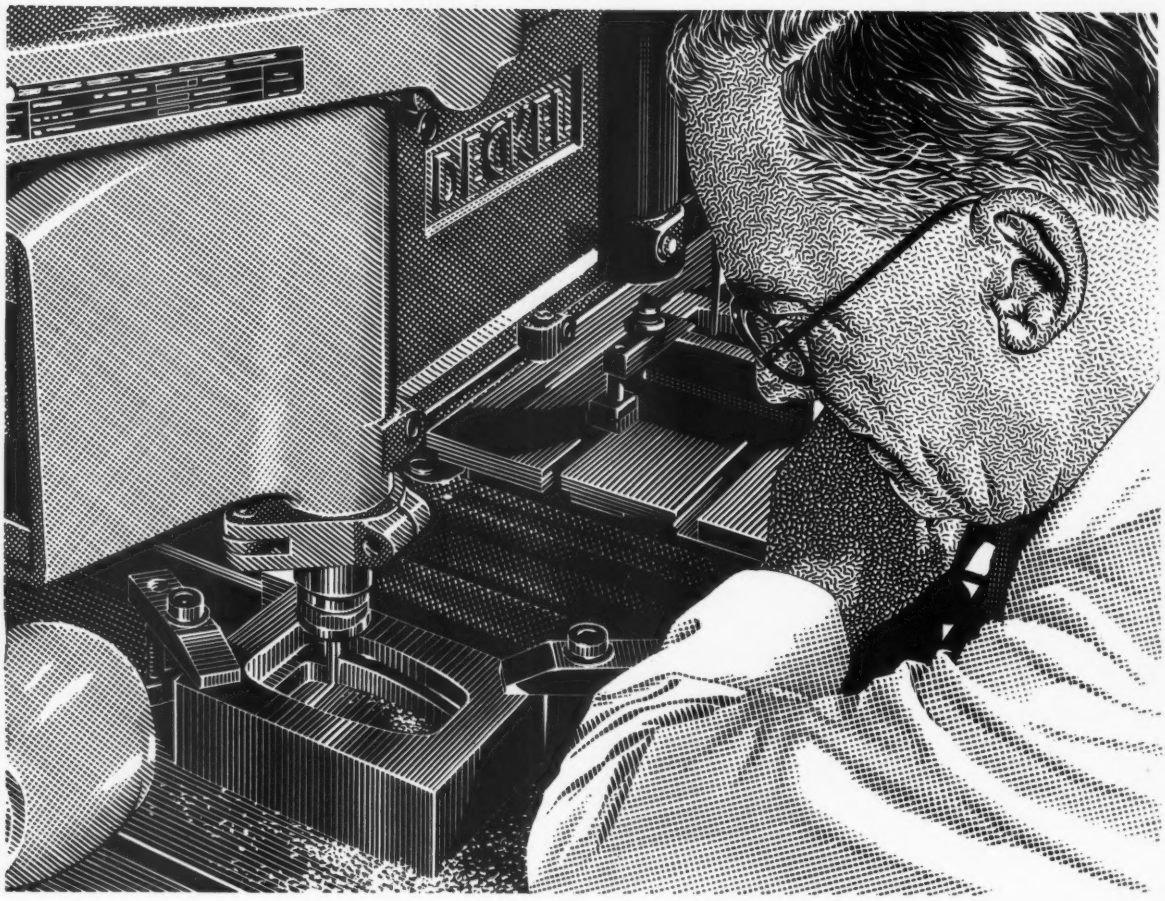

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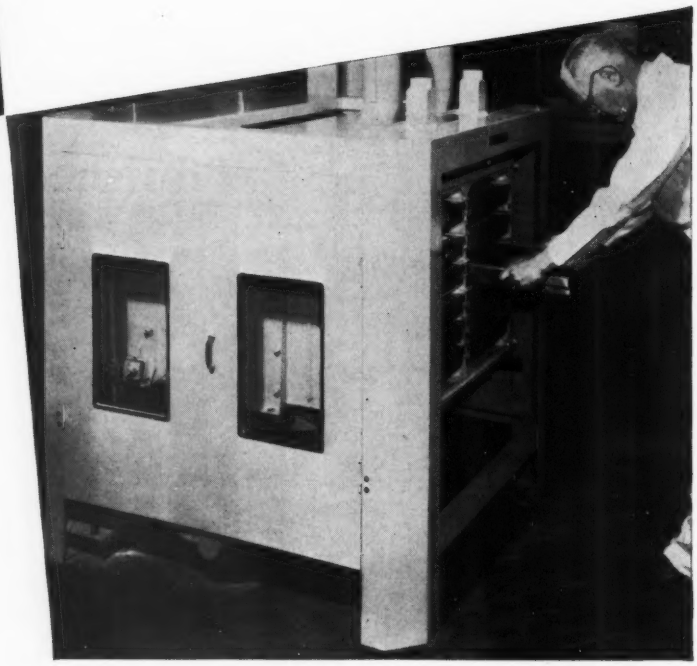

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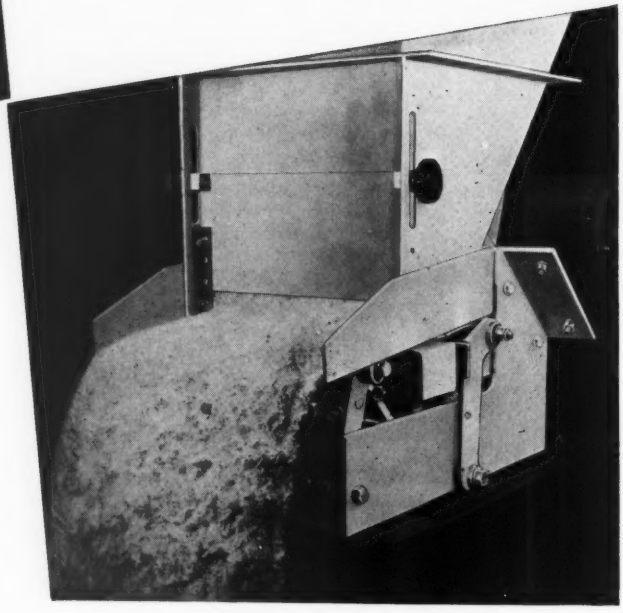

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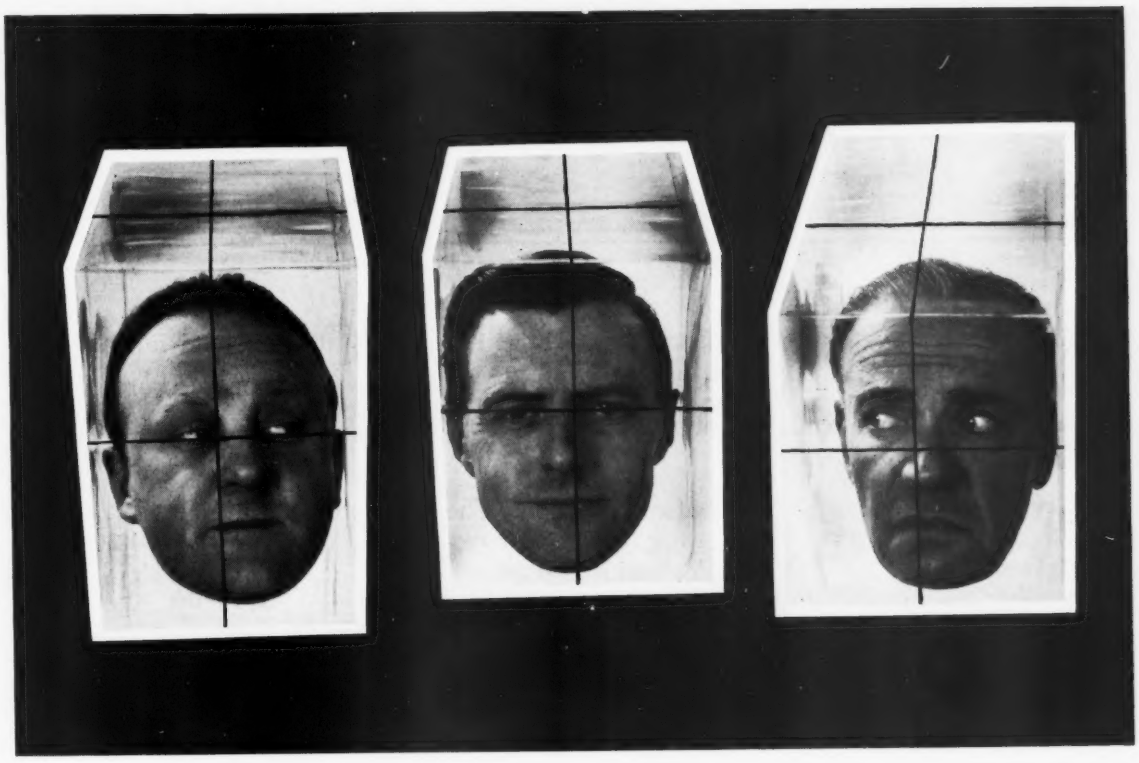

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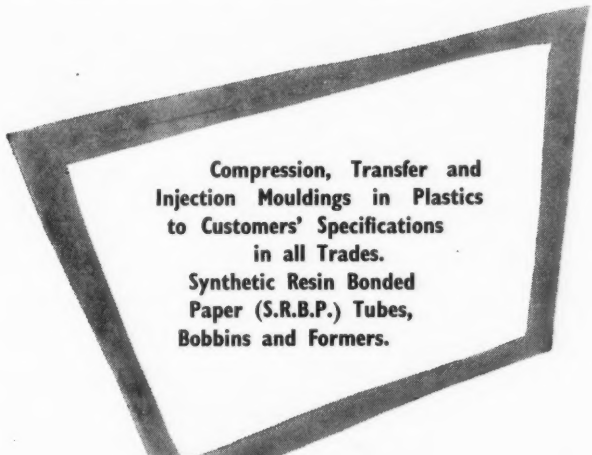

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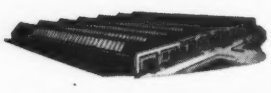

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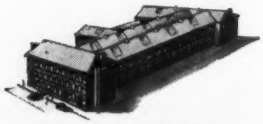

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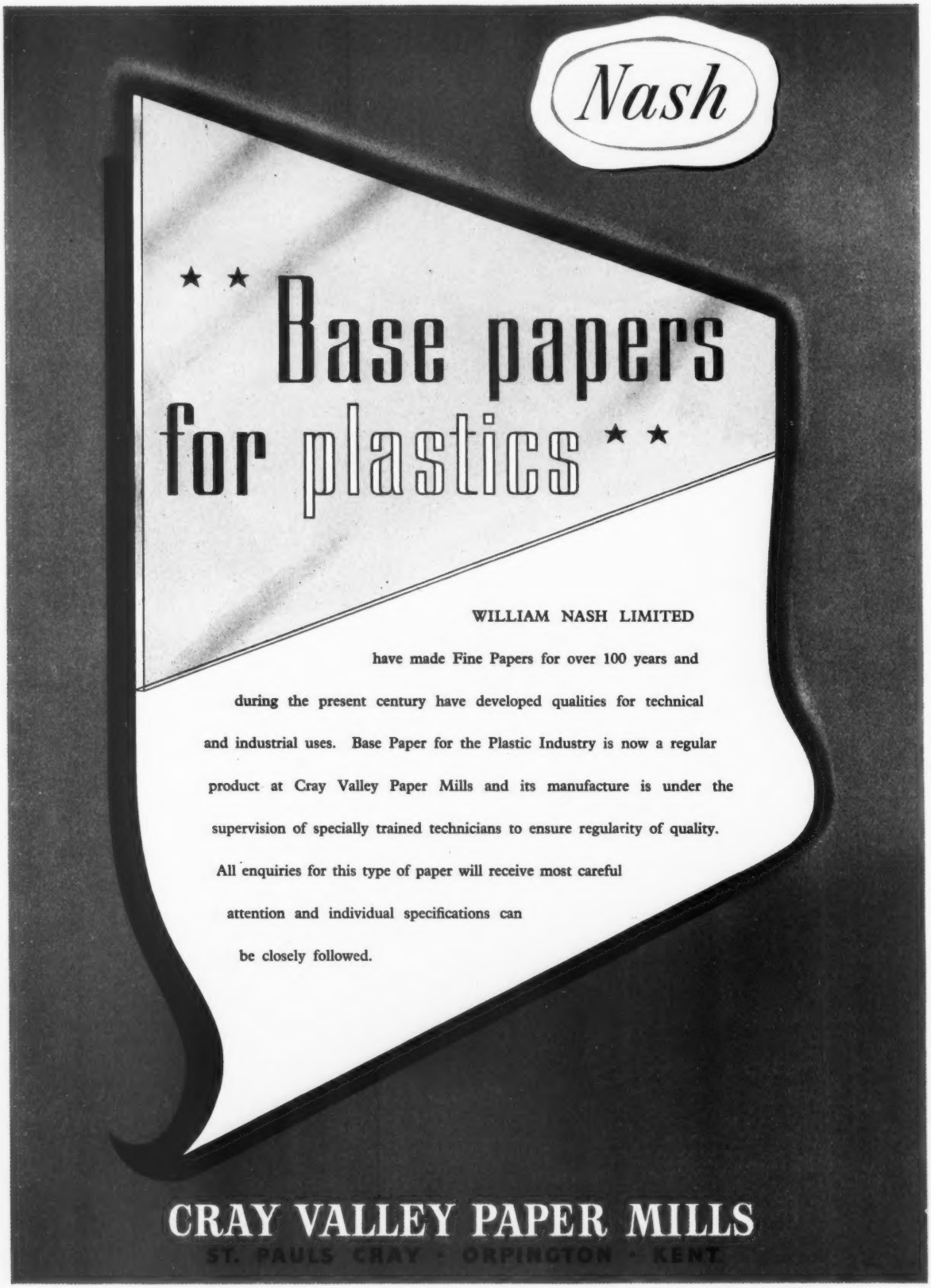
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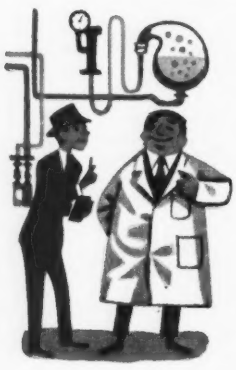
To the Duke, who said
please pass the port
A plumber was heard to retort
I'm not really a guest
But called at the request
Of 'er Ladyship oo wanted an
heffective heconomical and
hattractive PVC sealing strip
fitted between 'er bath
and the wall.

An author of novels romantic
Sailed here from across
the Atlantic
Not to write a new book
But simply to look
At some Lorival transparent
film which, he had heard,
is being used by libraries
and other interested parties
to cover existing book jackets
and protect them against
soiling and damage.

A stevedore loading on freight
Observed with a grin
to his mate
That lot in the hold
(If I might make so bold)
Would reach customers in much
better condition if it were
packaged in PVC sheeting
which is economical, effective,
moisture-and-chemical-proof.

The clapper-boy clapped
and was gone
The director screamed 'lights'
—there were none
Said a sleek, sloe-eyed starlet
You won't get very far pet
Until you learn that PVC
makes an effective and
economical insulating material
for all sorts of
electrical work.



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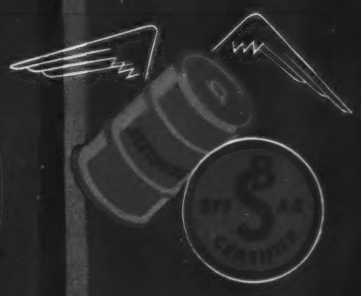

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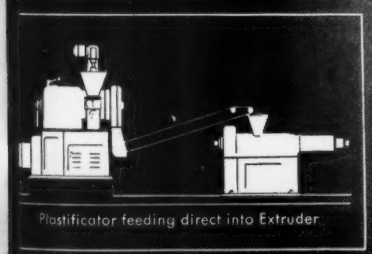

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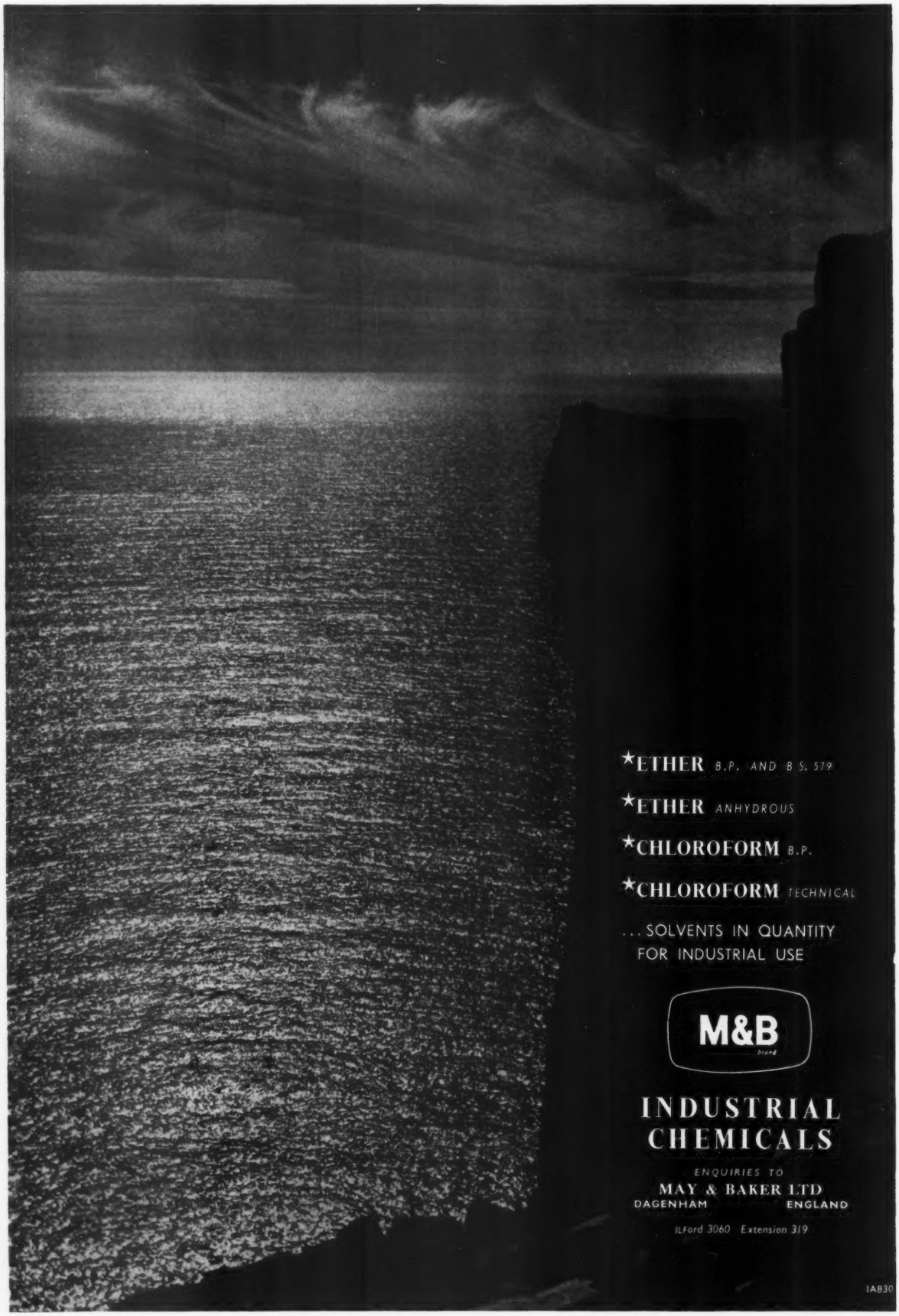
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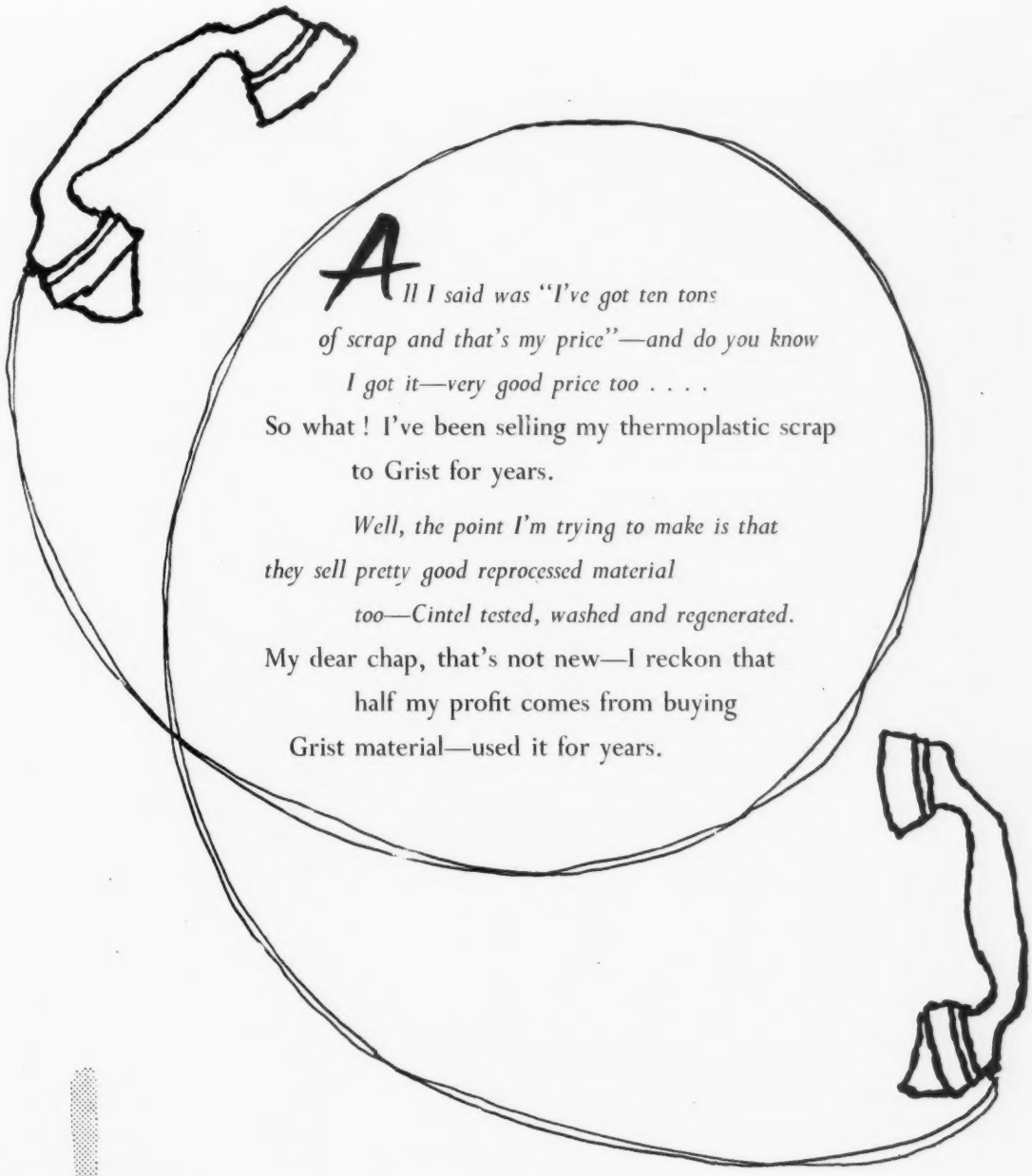

All I said was "I've got ten tons of scrap and that's my price"—and do you know I got it—very good price too . . . .

So what! I've been selling my thermoplastic scrap to Grist for years.

Well, the point I'm trying to make is that they sell pretty good reprocessed material too—Cintel tested, washed and regenerated.

My dear chap, that's not new—I reckon that half my profit comes from buying Grist material—used it for years.

the number is VICtoria 1414

GRIST PLASTICS 167 VICTORIA ST., LONDON, S.W.1.

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ONE OF THE DOHM GROUP OF COMPANIES

The Moulding Machine with that little 'extra'

THE NEW IMPROVED HUPFIELD 1¼ & 2¼ OZ CAPACITY INJECTION MOULDING MACHINES

Improvements include, quick purging of heating cylinder, a faster pump giving a 6 sec dry run, adjustment of injection pressure independent of mould locking pressure, a larger plasticizing capacity, and many other improvements which are the outcome of years of experiments in close co-operation with our customer's requirements. For particulars please write to:

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Welton Manor, Welton, Nr. Daventry, Northants

Telegrams: Plant Daventry Telephone: Daventry 257
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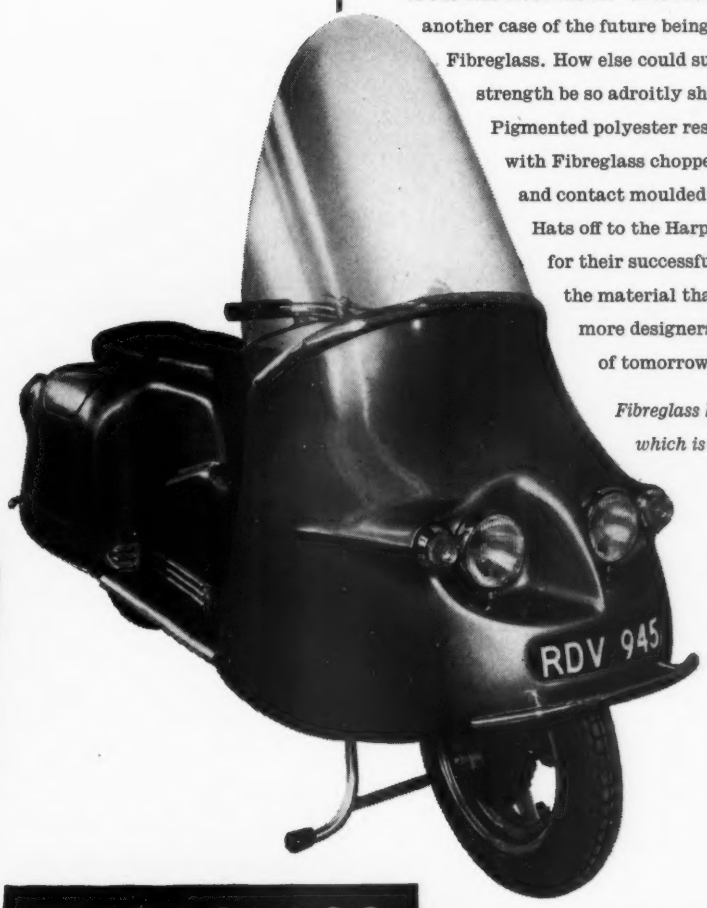
Your enquiries are invited for

A fully automatic controlled cycle attachment which can now be supplied for these machines

Moulding the future . . .



60 m.p.h. and up to 100 m.p.g. on a scooter streamlined like a space ship! Is this the materialisation of our childhood dream—or is it . . . yes, it is: yet another case of the future being moulded in Fibreglass. How else could such sinewy strength be so adroitly shaped!

Pigmented polyester resin was reinforced with Fibreglass chopped strand mat and contact moulded in only *two* sections.

Hats off to the Harper Aircraft Company for their successful enterprise—and to the material that is inspiring more and more designers of today and planners of tomorrow!

Fibreglass have an FRP advisory service which is expert, confidential and free.

FIBREGLASS TRADE MARK

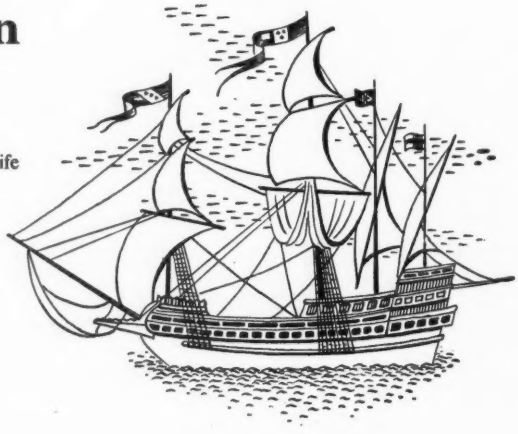
the backbone of Reinforced Plastics

FIBREGLASS LIMITED, RAVENHEAD, ST. HELENS, LANCS. TELEPHONE: ST. HELENS 4224

HIGHLIGHTS OF YORKSHIRE HISTORY

The escape of a Queen at Bridlington

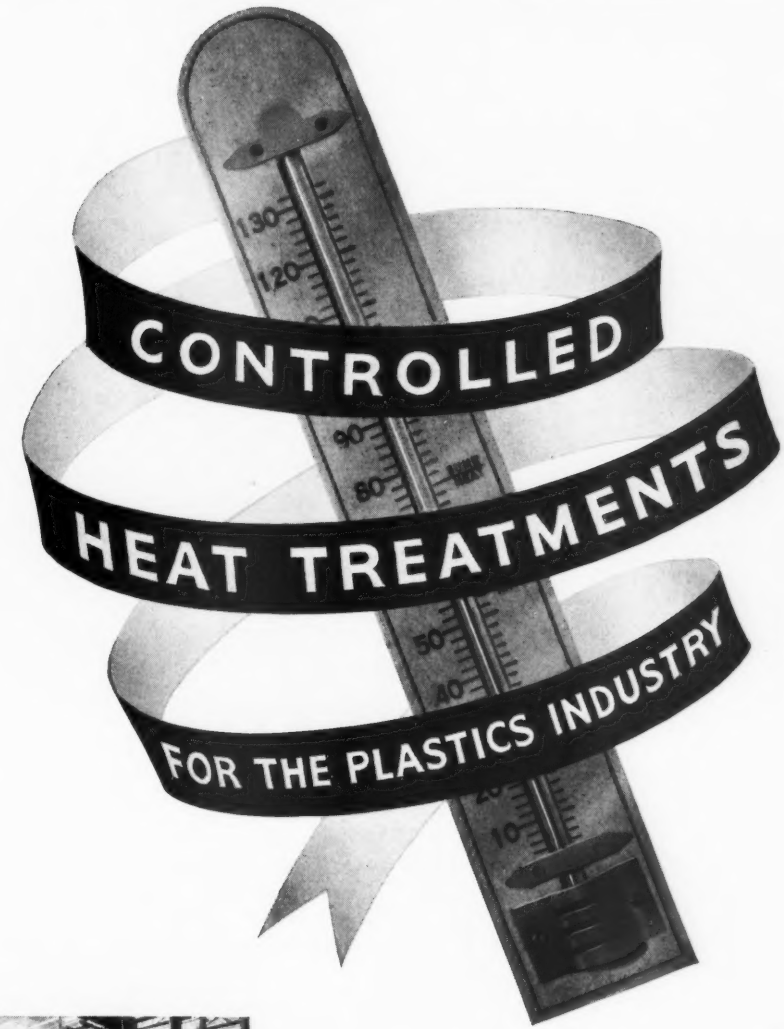
By sea to Bridlington in 1643 came Queen Henrietta Maria, wife of Charles I, daughter of Henry IV of France, upon her return from Holland. A Parliamentary fleet, learning of her arrival bombarded the quarter of the town and shots penetrated the house in which she reposed, forcing her, so it is said, to flee in no more than her shift and take refuge in a ditch, an ignominious act which probably saved her life.

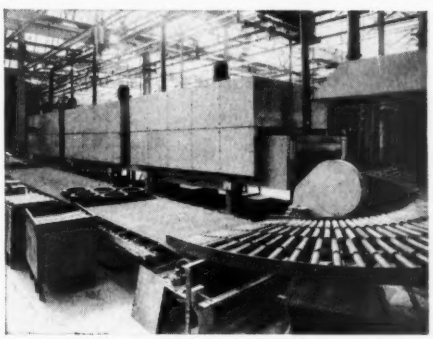


PLASTICS ELO PRODUCTS

Birkbys Ltd. Liversedge Yorkshire, Makers of Elo Plastics Products

SPOONER





Curing range for Resin Bonded Asbestos products
Photo by courtesy of Ferodo Ltd.

From setting nylon to fusing conveyor belting Spooners stand supreme. Our technical staff have had unrivalled experience of the varied and individual needs of the plastics industry and will be happy to advise you on all heat treatment problems.

SPOONER
REGISTERED TRADE MARK

THE SPOONER DRYER & ENGINEERING CO. LTD. Moorland Engineering Works, Ilkley, Yorkshire, England
Telephone : Ilkley 1771 (3 lines), Telegrams : Ilkley 1771, Cables : Spooner, Ilkley, England

Specially tailored Mr. Ash?

Of course, Mr. Downs. By someone who knew how to give me exactly what I wanted.

You mean like Ashdowns 'tailor' their "ASHLAM" laminates to their customers' requirements.

What a splendid example! Ask Ashdowns and they'll produce a laminate—or a plastic fabrication—with the precise properties needed.

And without any sacrifice of performance it will be the most economical material for the job.

Yes, the invaluable help and co-operation given by ASHDOWNS development engineers always ensure the perfect fit.

If you want to know what Plastics can do for you

ask Ashdowns

Makers of "ASHLAM"* laminates, glass fibre reinforced laminates and mouldings, "Undulite"* reinforced fibre-glass translucent sheeting, "FORMENE" G1 high impact polystyrene sheet and vacuum formed thermoplastic sheet fabrications.
Ashdowns Limited is a subsidiary of Pilkington Brothers Limited **Registered Trade Marks*

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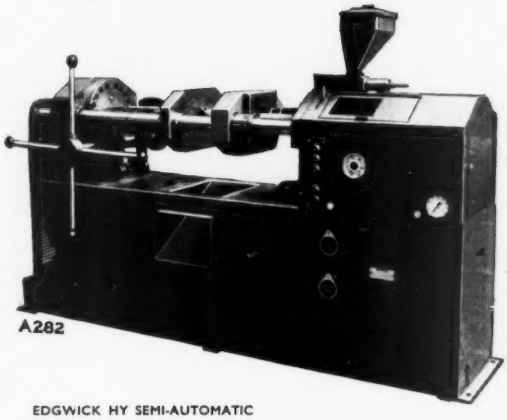
LONDON OFFICE: 29/30 ST. JAMES'S STREET, LONDON, S.W.1. TELEPHONE: WHITEHALL 6002

A range of FOUR . . . .
INJECTION MOULDING MACHINES

with moulding capacities from 1½oz up to 22oz

This has been achieved by fitting Double-Shot Mechanism to increase the machines' capacity by double-packing



EDGWICK HY SEMI-AUTOMATIC

★

EDGWICK HY

MOULDING CAPACITY: 1½ OZ.

MOULD LOCKING PRESSURE: 35 TONS

SIZE OF DIEPLATES (H x V) 12½" x 11"

★

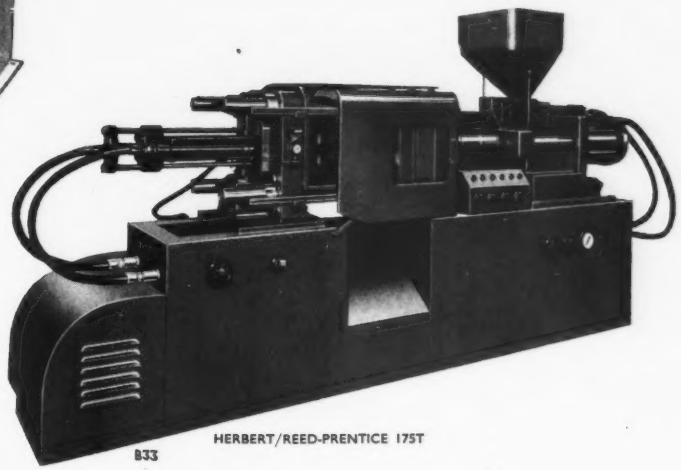
HERBERT/REED-PRENTICE 175T

MOULDING CAPACITY: 4 OZ.

MOULDING CAPACITY WITH DOUBLE-SHOT MECHANISM: 6 OZ.

MOULD LOCKING PRESSURE: 175 TONS

SIZE OF DIEPLATES (H x V) 22" x 24½"



HERBERT/REED-PRENTICE 175T

HERBERT/REED-PRENTICE 10D

★

HERBERT/REED-PRENTICE 10D

MOULDING CAPACITY: 8 OZ.

MOULDING CAPACITY WITH DOUBLE-SHOT MECHANISM: 14 OZ.

MOULD LOCKING PRESSURE: 250 TONS

SIZE OF DIEPLATES (H x V) 21" x 25"

★

HERBERT/REED-PRENTICE 400T

MOULDING CAPACITY: 16 OZ.

MOULDING CAPACITY WITH DOUBLE-SHOT MECHANISM: 22 OZ.

MOULD LOCKING PRESSURE: 400 TONS

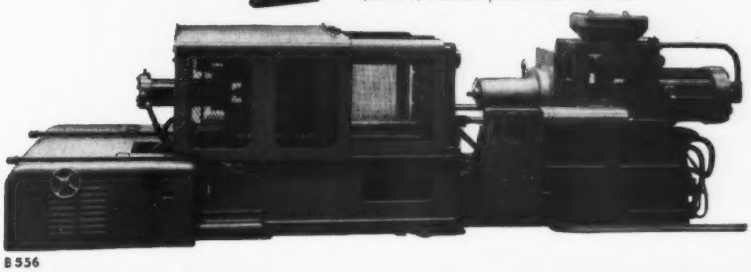
SIZE OF DIEPLATES (H x V) 38" x 36"

(BELOW) HERBERT/REED-PRENTICE 400T

WE CAN DESIGN, SUPPLY AND TEST DIES FOR THESE MACHINES, AND ALSO DEMONSTRATE THEM TO YOUR SATISFACTION.

●

CATALOGUES AVAILABLE



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MELAMINE

By courtesy of Halex, Highams Park, London E.4.

better to mix in

Hard, smooth, scratch-resistant, chip-proof, unbreakable, lightweight, easy to clean, attractive to look at . . . that's Melamine! No wonder housewives all over the country are finding bowls made with melamine resins are the best for mixing.

But melamine is not only used in the home. In cafes, restaurants, canteens—wherever there is catering—melamine cups, saucers, plates, spoons and trays are coming into their own. British Oxygen Chemicals make only the *chemical* Melamine; names and addresses of manufacturers of Melamine resins and moulding powders will be supplied with pleasure. Please write for further information to:—

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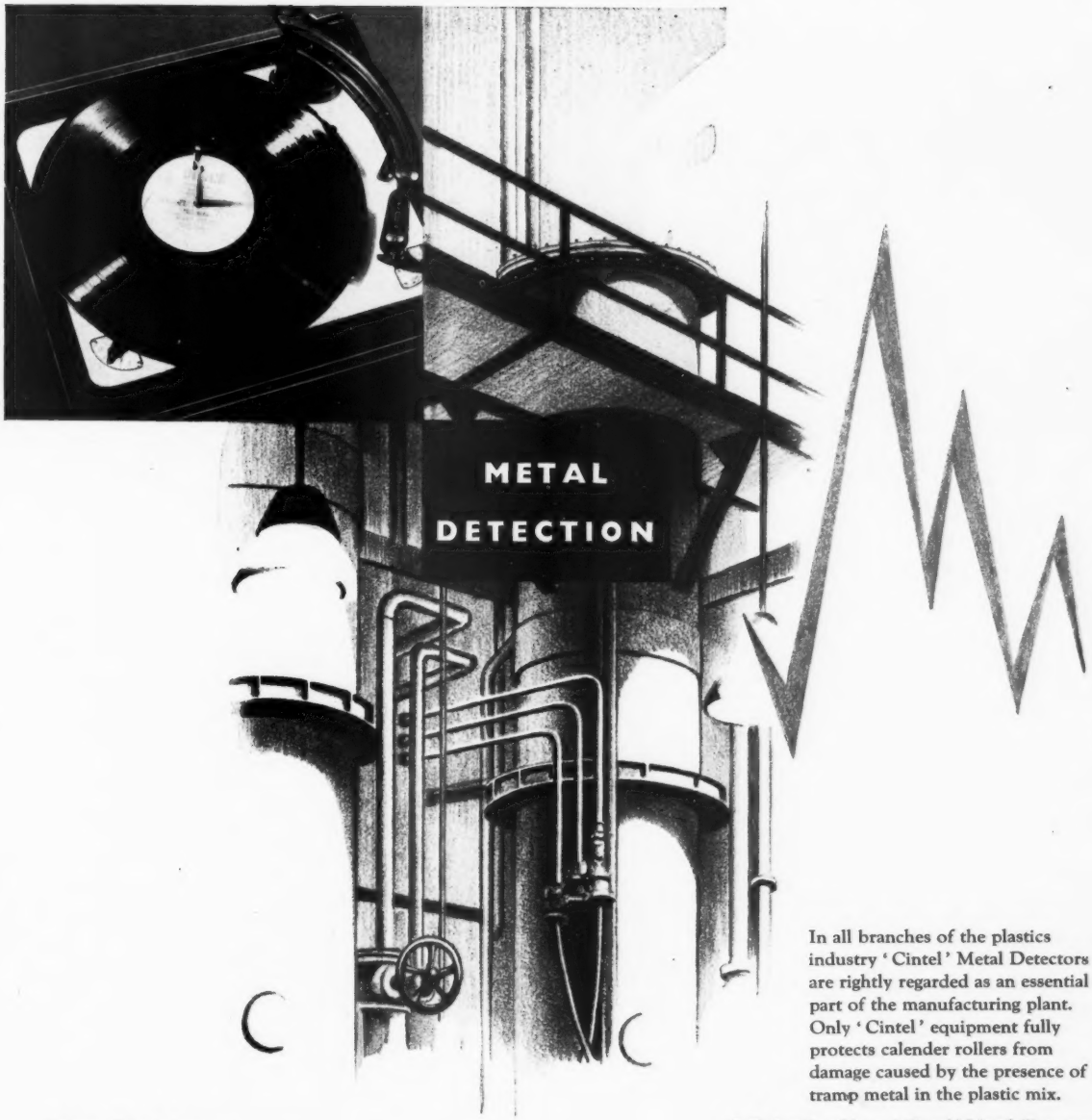
Vigo Lane, Chester-le-Street,
Co. Durham.
Tel: Birtley 145.
London Office: Bridgewater House, St. James's,
London, S.W.1. Tel: WHI 9777

BRITISH OXYGEN CHEMICALS LIMITED



Hydrogen Chloride Burners—
part of the manufacture of Polyvinyl Chloride

In all branches of the plastics industry 'Cintel' Metal Detectors are rightly regarded as an essential part of the manufacturing plant. Only 'Cintel' equipment fully protects calender rollers from damage caused by the presence of tramp metal in the plastic mix.

Full details of how 'Cintel' Metal Detectors can help you are available on request.

Cintel

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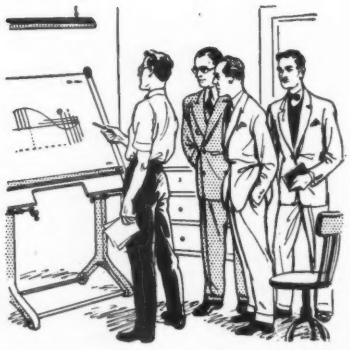
LET US MOULD IT FOR YOU IN



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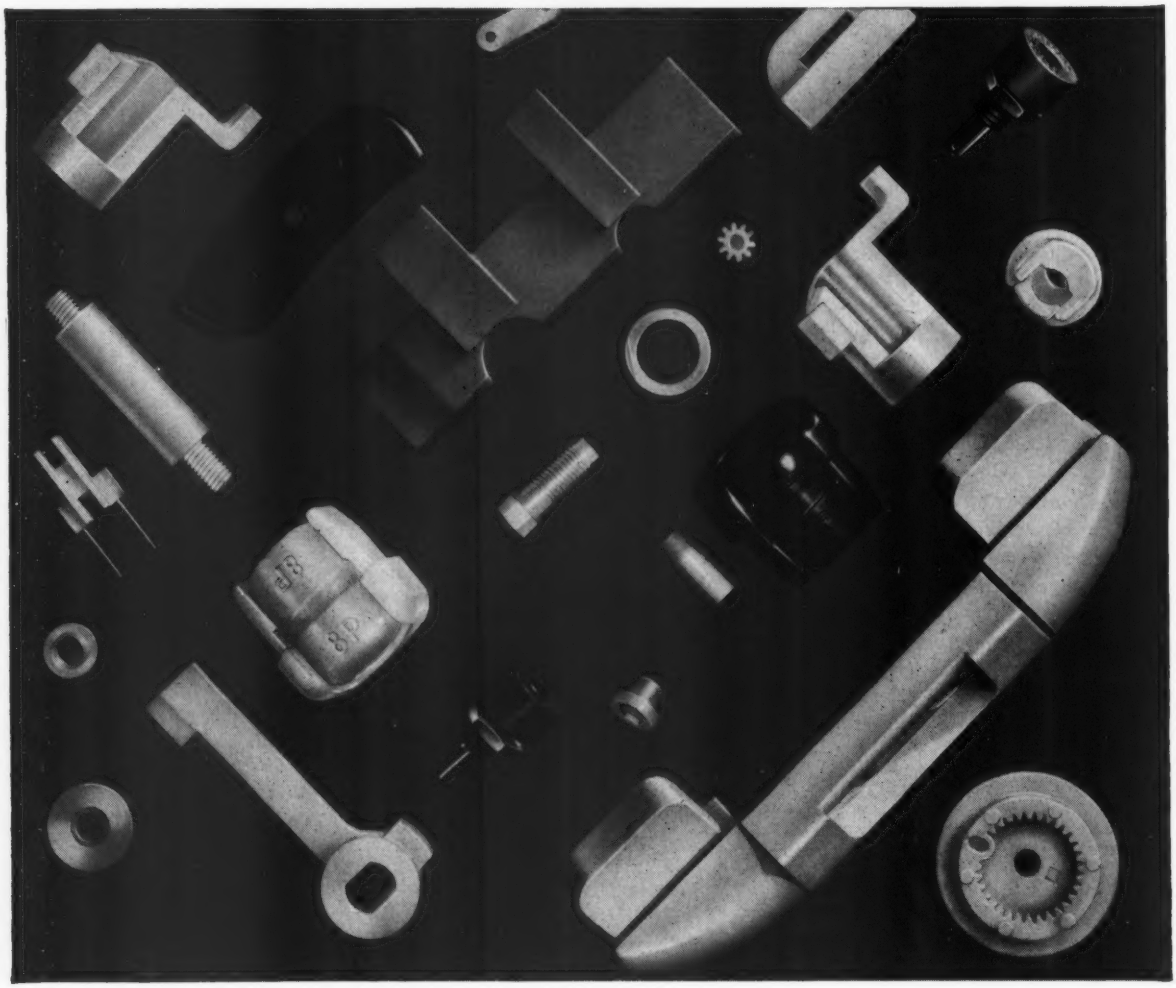
Maybe NYLON is the material for *your* particular problem. Tough, resistant to high temperatures and most chemical solvents, NYLON is eminently suitable for the moulding of a very wide range of articles.

We shall be glad to have your enquiries regarding NYLON moulding for *your* industry. Everything under one roof — Design Unit, Drawing Office, Tool Room and large Moulding Shop — completely at your disposal.



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WESTMORELAND RD, LONDON NW9

Telephone: COLINDALE 8868/9 & 8860

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UNITED KINGDOM ORGANIZATION

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Telephone: Abbey 7538

Telegrams: Polyamide, Sowest, London

Cables: Polyamide London

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The Mitchell Coating, Stoving and Drying plant illustrated below is installed for use in the production of Formica decorative boards in the modern factory of Thomas De La Rue & Company Limited.

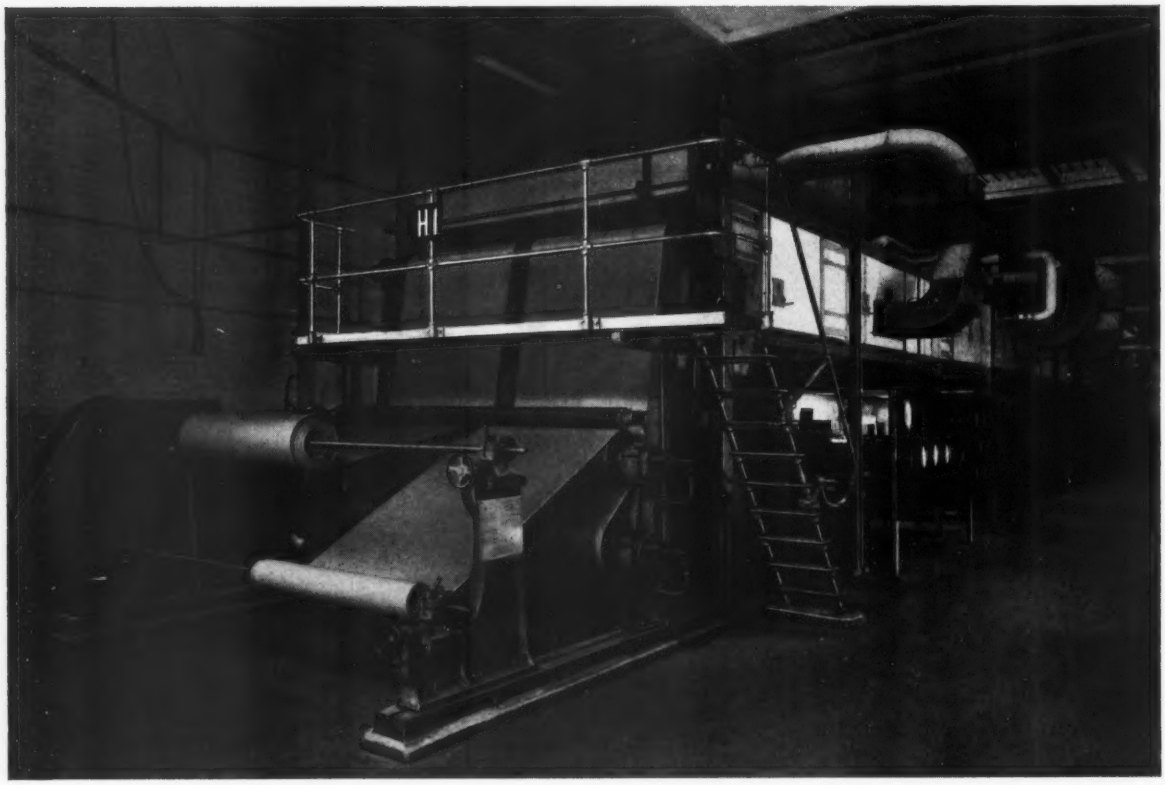
MITCHELL Impregnators for the production of laminates.

Mitchell modern continuous impregnators are supplied of the horizontal and vertical types for coating, impregnating and stoving papers and fabrics for the manufacture of laminated products.

Materials handled in Mitchell impregnators include:
ASBESTOS for giving increased heat resistance.
PAPERS for electrical insulation.
DECORATIVE BOARDS for the furniture trade.
FABRICS for increasing strength.
GLASS FIBRE SHEETING for insulation.

Our experience over many years in the Plastics and Chemical Engineering industry is at your disposal. Plants designed to suit customers' specific requirements.

Enquiries also invited for stoving ovens for resin coated components and parts—complete synthetic resin distillation plants—fluid agitating and mixing equipment, comprising propeller type mixers, turbo agitators, side entry mixers for chemicals, resins and plastics—Sparkler horizontal plate Filters for clarifying and polishing resins, etc.



L. A. MITCHELL LTD. 37 Peter St, Manchester.

Industrial Drying Engineers *Phone: BLAckfriars 7224 (4 lines)*

MD.60

MOULDED PARTS WEAK AND BRITTLE?

See Section 13 for remedies

HAVING TROUBLE WITH HEAVY SECTIONS?

See Section 16 for advice on this

HOW'S ONE TO PREVENT SPRUE STICKING?

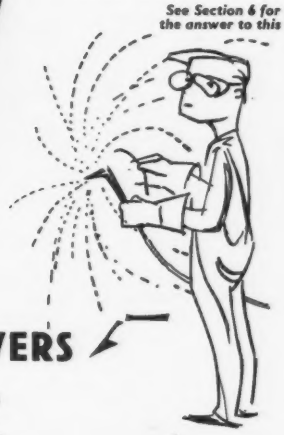
See Section 4 for the solution

Kleestron

Manufacturers of

WHAT'S TO DO WHEN SHRINK MARKS APPEAR ON MOULDED PIECES' SURFACES?

See Section 6 for the answer to this



WELDING PROVING A PROBLEM?

See Section 11 for seven possible solutions

Kleestron

PROVIDES THE ANSWERS

Yes—here in Kleestron's newest aid to plastics people are the answers to those problems met with in moulding shops. Prepared by Kleestron researchers the Trouble-Shooting Guide (tabulated for easy reading) lists a total of over 250 faults and remedies. Cause, effect and necessary action are all dealt with. It's a booklet that no moulding shop should be without; and it's absolutely FREE. Make sure of *your* copy of Kleestron's POLYSTYRENE MOULDERS' TROUBLE-SHOOTING GUIDE. Write, phone or call today!

Kleestron H469 — high impact polystyrene in extruded or dry colourant pellets

Kleestron Crystal 604 — dry colourant blend

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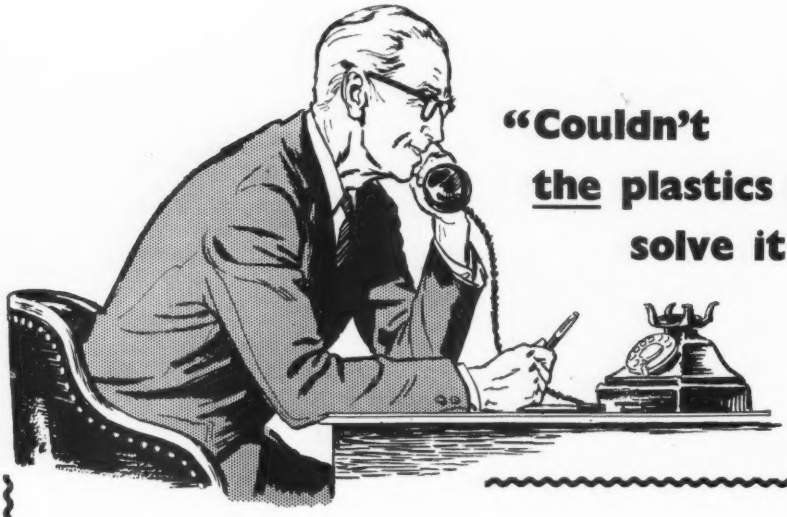

"Couldn't the plastics people solve it?"

It's amazing the things you can do—the problems you can solve—with plastics today. Fraser and Glass are the people to help you. A light, tough plastic moulding from Fraser and Glass can cut your costs, increase efficiency and help to make a product more attractive, easier to sell. Yes, Fraser and Glass have all the manufacturing ability you need; the knowledge to pick the type of plastic best suited for your problem; the experience (over 30 years of it) to ensure a successful job. If plastics can help, Fraser and Glass are the people to tell you.

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the plastics people

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therefore

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FULLY AUTOMATIC INJECTION MOULDING MACHINES

1/2 to 50 ozs. capacity

BATTENFELD MASCHINENFABRIK **MEINERZHAGEN i. WESTF.** Germany

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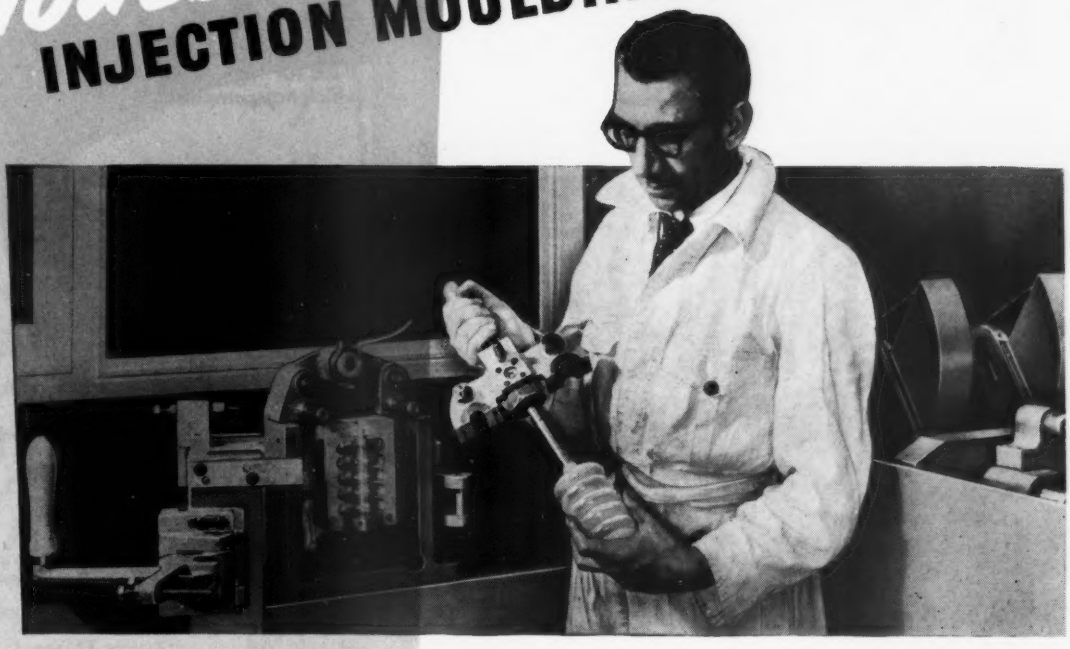
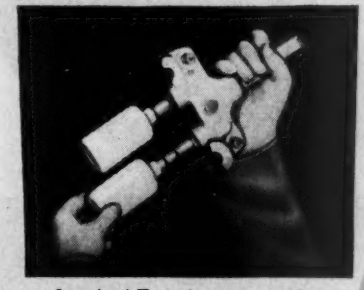
BLOW MOULDING ON YOUR INJECTION MOULDING MACHINES



Blow stick showing 2 litre square bottle



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Increase the scope and profit making potential of your moulding equipment with a Granbull Blow Moulding Unit. It is used in conjunction with any standard moulding machine, converting it for blow moulding at a fraction of the cost required for special purpose machinery. Write for full details of the Standard and Major Units, stating your specific requirements and giving the type and capacity of your moulding machines.

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- ★ SUITABLE FOR LONG OR SHORT RUNS
- ★ SINGLE TWIN OR MULTI-IMPRESSION
- ★ ELIMINATES HEAVY COST OF SPECIAL PURPOSE MACHINERY

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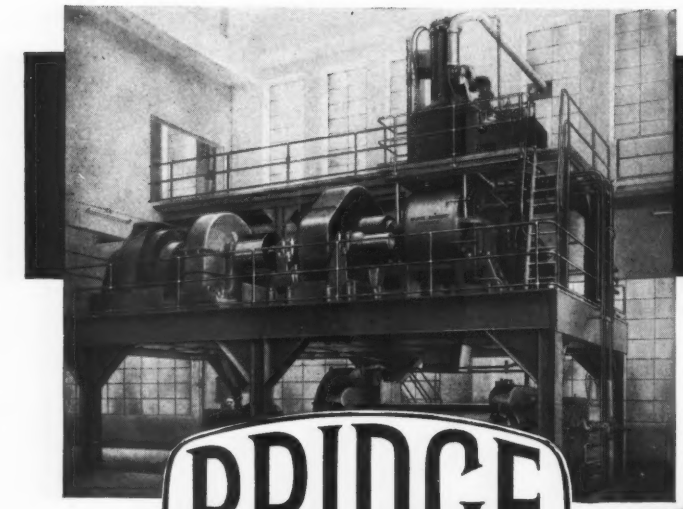

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Isn't it?

Not a bit of it! Whether you're a soprano or a synthetic resin manufacturer you can always rely on them both. No matter what the modern composers have up their sleeves, the familiar " doh, ray, me, fah " incantation remains the same. Similarly, thirty years of bewilderingly rapid development in the synthetic resin industry have not changed the constant uniformity of Synthite Formaldehyde. And another thing; you can always rely implicitly on your formaldehyde deliveries. A telephone call is sufficient to bring our fast tankers speeding towards your plant, no matter what part of the country it may be.

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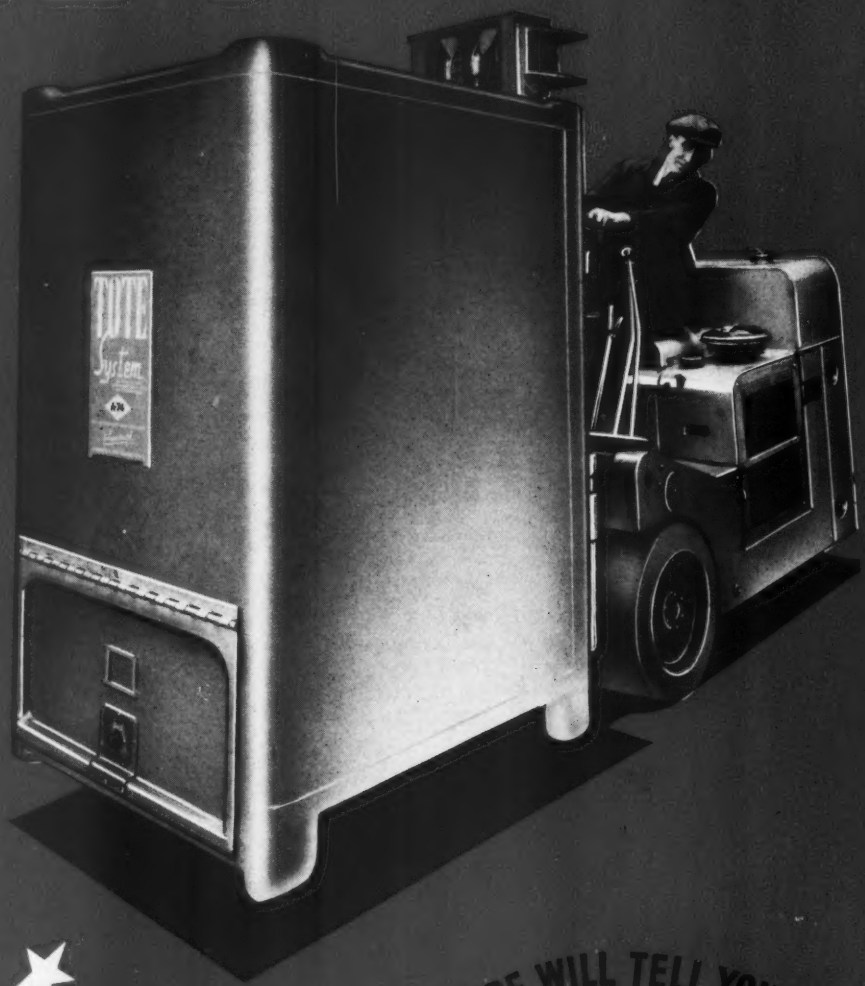

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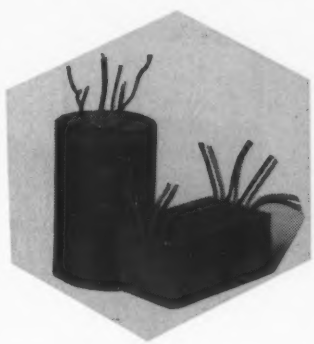

SHELL CHEMICAL COMPANY LIMITED SHELL 105/109 Strand, London, W.C.2. *Tel:* TEMple Bar 4455

E.EI.1

"EPIKOTE" *is a Registered Trade Mark*

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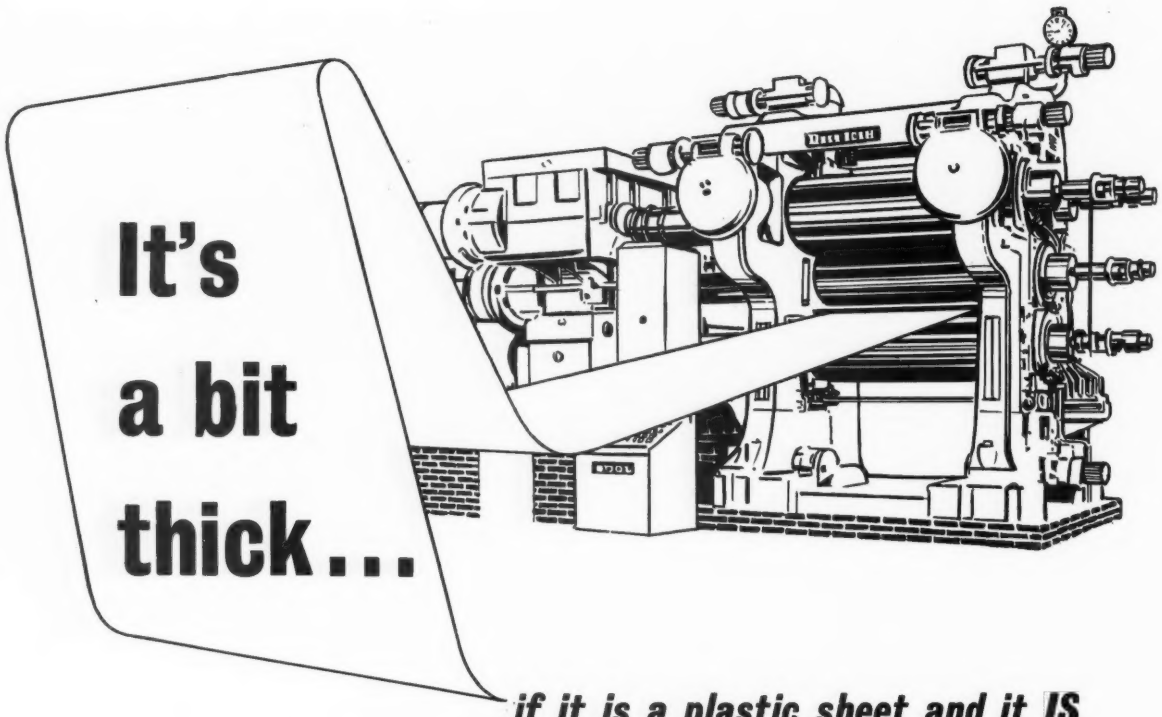
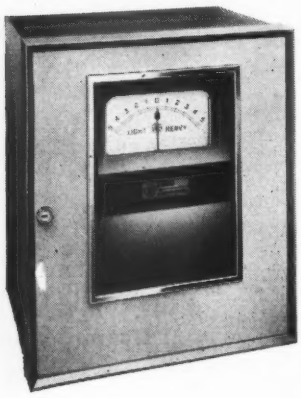


if it is a plastic sheet and it IS a bit thick—or thin—the result is plain... Somebody is losing money

We have had very extensive experience in the development and production of thickness gauges and have supplied large installations to leading manufacturers in Great Britain, U.S.A. and throughout the world. The gauge illustrated below is a new instrument incorporating many outstanding features.



Without touching the flowing sheet the EKCO NUCLEONIC THICKNESS GAUGE eliminates test sampling by giving continuous indication of thickness: it provides immediate warning of variation: it reduces time taken in arriving at the correct thickness when starting up: accuracy is in order of 1% and it is suitable for measuring all plastic materials. The Ekco Nucleonic Thickness Gauge is a time and money saver to everyone who needs control over the thickness of continuous plastic sheet, and coatings of any type on plastic sheet. We shall be pleased to send you further details of the Ekco Nucleonic Thickness Gauges or our Technical representatives will be glad to call and discuss your requirements without obligation.

EKCO

nucleonic thickness gauges

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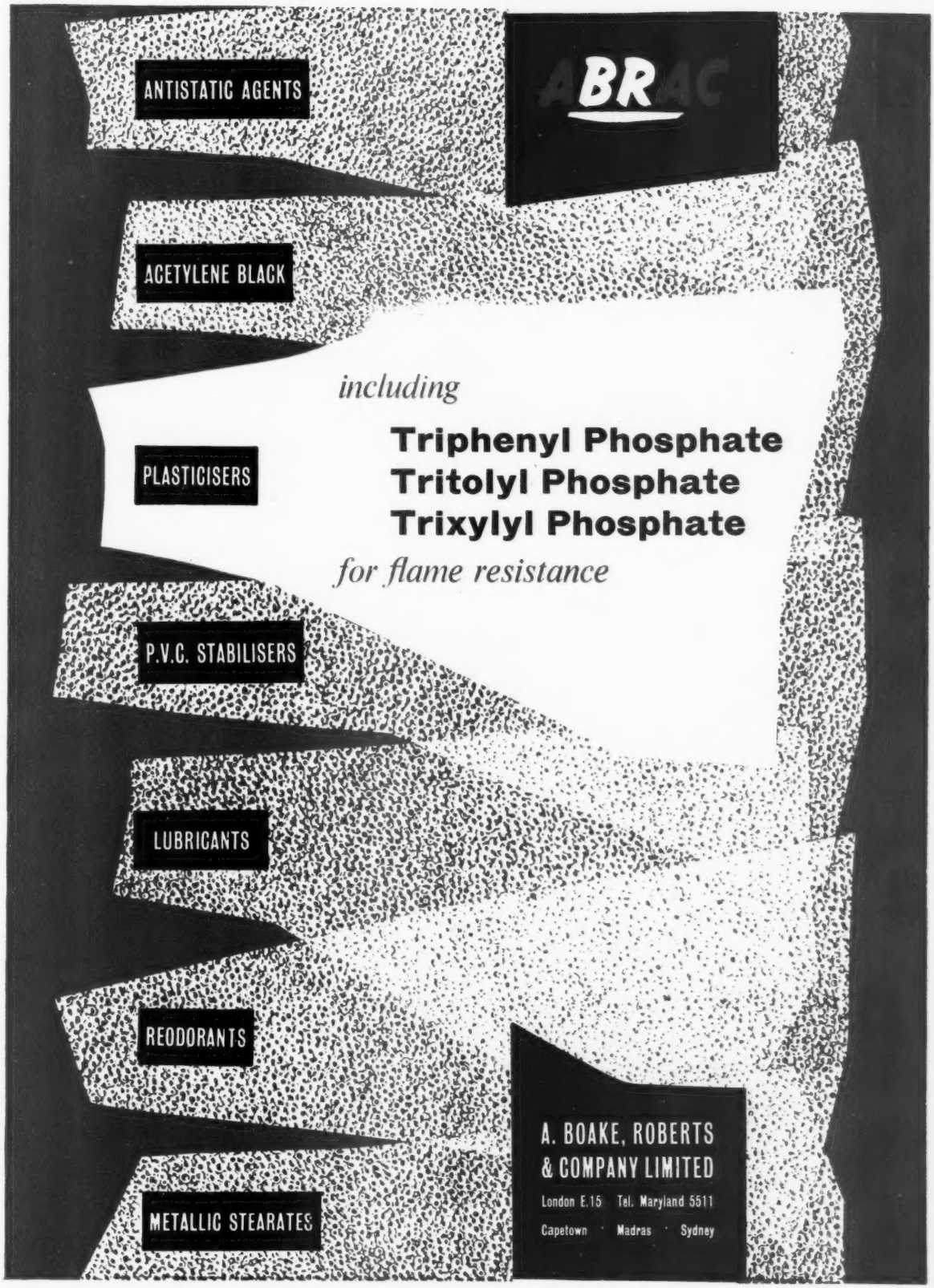
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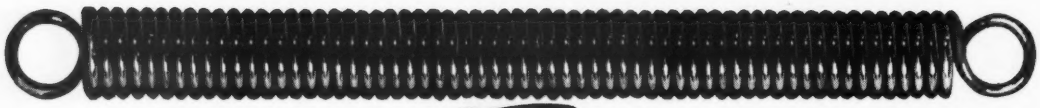
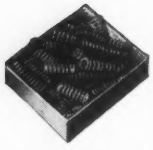
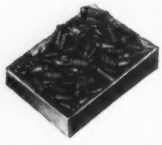


No. 760. 3 doz. Assorted Light Compression Springs 1″ to 4″ long, 22 to 18 S.W.G., ¼″ to ½″ diam. 6/6 each.

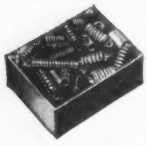


No. 98A. 3 doz. Assorted 1″ to 4″ long, ½″ to ¾″ diam., 19G to 15G. 5/6 each.

No. 757. Extra Light Compression, 1 gross assorted, ⅛″ to ⅜″, ½″ to 2″ long, 27 to 20 S.W.G. 15/- each.



No. 388. ½ gross Assorted Small Expansion Springs. ¾″ to 1½″, 18G to 21G. 9/6 each.

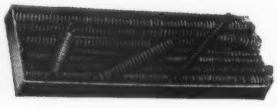


No. 758. Fine Expansion Springs. 1 gross Assorted ⅛″ to ⅜″, ½″ to 2″ long, 27 to 20 S.W.G. 15/- each.

No. 466. ½ gross Assorted Small Expansion Springs ⅜″ to 1½″ long, 3/32″ to 3/16″ diam., 21G to 24G. 6/6 each.

No. 1013. 1 gross Small Coil Compression Springs, ⅜″ to 1½″ long, 3/32″ to 7/16″ diam., 24G to 19G. 6/- each.

No. 753. 3 doz. Assorted Light Expansion ½″ to ½″ diam., 2″ to 6″ long, 22 to 18 S.W.G. 10/6 each.



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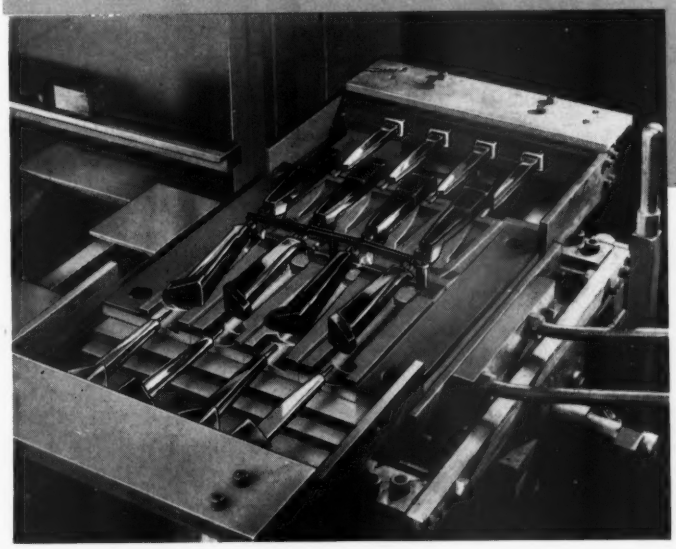

THE TOOL AND PRESS

The tool is designed to produce four upper and four lower handles at a time on a BIPEL Type 200 Auto Control Press. The die plate is withdrawn into an auxiliary fixture, where all the side cores are withdrawn at the same time and where, with pneumatic assistance, all the eight mouldings are ejected from their dies.

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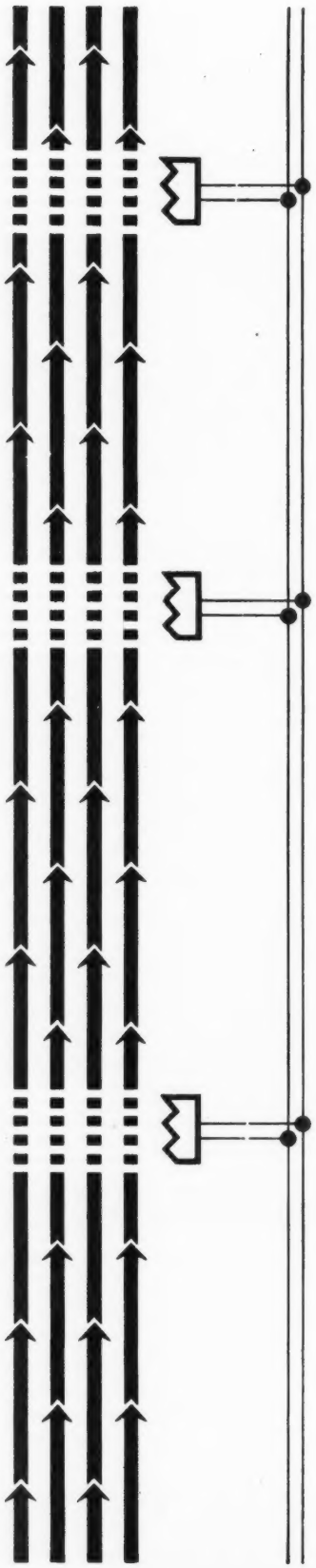

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For over twelve years washing machine agitators moulded from BAKELITE Phenolic Moulding Material X13080 have helped housewives on washing days. Agitators produced from this special grade material operate constantly under exacting conditions in hot and cold water without corroding or failing under chemical attack. They are strong and durable to meet the specification of manufacturers; smooth and "snagless" to satisfy critical housewives. BAKELITE X13080 Phenolic Material is used for a wide variety of applications and moulds readily into complex shapes.

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TGA MP3

BAKELITE RESINS
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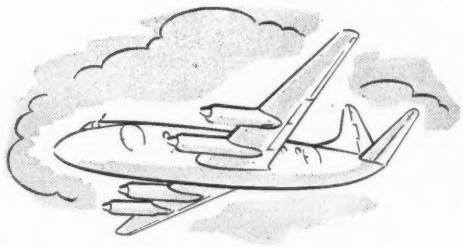
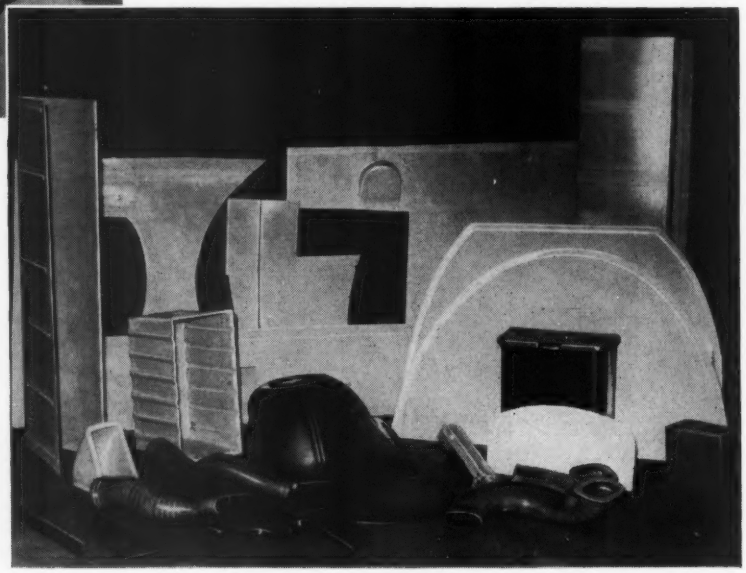


in the

VICKERS VISCOUNT

BAKELITE Polyester Resins, reinforced with glass fibre, were specified by Vickers-Armstrongs for many parts in their famous airliner where a combination of strength and light weight is important. They are easily moulded whole without presses or elaborate equipment, and protective painting is not essential. Please write for further information about these versatile materials.

Finishing the lay-up of a battery box in the Plastics Division, Vickers-Armstrongs Ltd., Weybridge.



Panelling, ducting, luggage racks, battery boxes, soiled-linen boxes and other components made from BAKELITE Polyester Resins reinforced with glass fibre, and used in the Vickers 'Viscount'.

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TGA RPS

Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

PROPRIETORS: TEMPLE PRESS LIMITED

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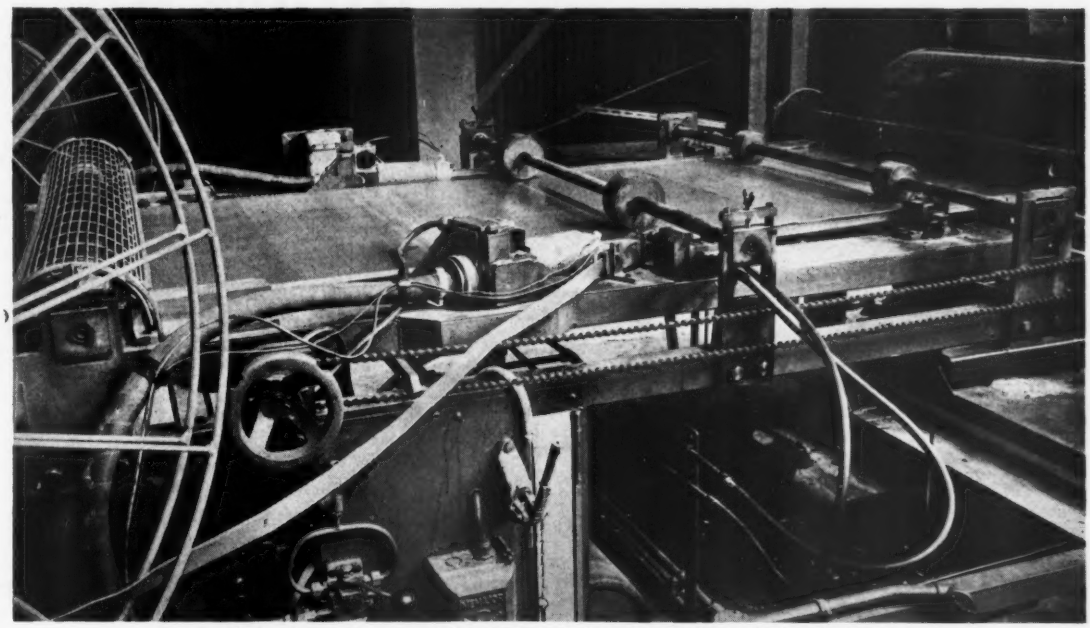

Edging plant for p.v.c. mine belting at the Speke factory of the Dunlop Rubber Co. Ltd.

NP44

Eighteen years ago the first plastics facia panel fitted to any Hillman Car was designed and produced in large quantities at our Walthamstow factory. Now, on the latest Hillman Minx, the two-piece steering column cowl and the warning light panel are "thermosetting" plastics mouldings engineered and produced by National Plastics at the same factory.

HILLMAN CARS use NATIONAL PLASTICS

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Plastics

VOL. XXI. No. 227 AUGUST, 1956

EDITORIALS

Large Injection Machines

SUCH is the plastics industry. If our Chancellor of the Exchequer, by restricting the purchase power of our 50,000,000 customers in this country, has sent many of our plans all awry for the time being, at least we can gain comfort at the increased rate of scientific and technical progress. Here too the effect of kaleidoscopic change can be bewildering, but the picture soon resolves into a clearer view of immense significance and promise for the future.

How often we must swallow our words of yesterday ! It is scarcely a handful of years ago that the 32-oz. and the 48-oz. injection machines were objects of wonder and all were concerned whence the jobs for them were to come. Quickly on their heels came the 60-oz. and the 100-oz., and it is only last year that Peco installed its huge 160-oz. machine in the works of Halex Ltd. for turning out large bins in polythene. The vast 300-oz. made by the Watson Stillman Co. in the U.S.A. is doing yeoman service in the works of Prolon Plastics of Florence, Mass., and the first named company has already produced a 500-oz. machine. Now it is Europe's turn to burst forth in the same range; the swing is to Italy where the F.I.M.S.A.I. company of Milan has made two giants, one of 8,000 grammes (285-oz.) capacity and the other of 12,000 grammes (428-oz.) capacity.

The first, we saw this year at the Paris Fair, together with an example of what is being made on it by Sta. Olympo-Stampi of Milan. This unit is a large shallow tank-like structure, which sends the mind racing off to many other possible jobs of general use that have never before been possible by moulding methods.

Polythene, Polypropylene and Polystyrene

THE kaleidoscope turns again and there is another picture—a different picture, but one which we must examine closely side by side with the first because both will undoubtedly be related in the future.

The advent of the new polythenes with greater rigidity and greater heat resistance (120°-125° C.) will gradually force open new fields of application hitherto closed to the plastics industry. Already the extruders and the injection machines are being modified and doubtless soon we shall see their products in the chemical factories and in other employment. But neither this technical picture of new polythene nor of big machines is as significant as the new scientific discoveries in plastics manufacture that now confront us.

We have all heard of the work of Ziegler in Germany in the field of polythene production by catalysis at low pressures. A new name, that of Giulio Natta of the Milan Technical Institute appears on the scene, and our announcement three months ago of the production of polypropylene was the first to be made in this country of his work. The significance of polypropylene lies, however, not in the production merely of a new polymer. Its importance lies in the fact that like the Ziegler polythene, Natta's polypropylene is a crystalline material, that is, the structure of the molecule is orientated—exceptionally regular throughout its length—which gives very high fusion points (high moleculer weight polypropylene melts at 160°-170° C.), great insolubility and rigidity. Natta's work with new types of catalyst, similar to those used by Ziegler, also covers that of polystyrene and here again very startling results are achieved. The normal type of polystyrene is (like the normal polythene) preponderently amorphous or non-crystalline and has low heat resistance. His new polystyrene is crystalline which raises the heat resistance to a temperature of 200° C. and is much more insoluble to some organic solvents than the normal type. If the original polystyrene disappointed some because of its comparatively low strength which forced the world to produce a stronger product by mixture with rubber, there is cause for rejoicing at the appearance of what should prove yet another valuable material of great technical and structural worth on its own merits.

Tie all these new discoveries together with the new engineering developments that are taking place and we cannot but arrive at yet a new conclusion. The future of the plastics industry is suddenly and startingly brighter even than we have ever imagined, and it has always been bright.

Plastics and Rubber

THE Annual Luncheon of the Plastics Institute held on July 3 at the Dorchester Hotel was also the happy occasion for celebrating its Silver Jubilee. Twenty-five years may seem no great age to many other institutions created for the purpose of furthering the scientific and technical knowledge of industries, but in that space of time which embraces the organized life of almost all that we call the modern synthetic resin industry, none has seen more spectacular or more rapid advances in its own sphere nor, we believe, such technological and often sociologically beneficient effects on mankind as a whole. The luncheon was clearly an occasion to congratulate those who have worked so hard in the past in creating and sustaining the fortunes of the Plastics Institute and to pay fitting tribute to the President and by inference to all past Presidents. The investment of Mr. Lionel Daniels, whose family has so long been of service to the plastics industry, with a truly magnificent chain of office, was a happy thought.

It was clearly a sign of the times we live in that the Chief Guest was the Rt. Hon. Lord Baillieu, K.B.E., C.M.G., whose great services during his Presidency of the Federation of British Industries and after, made this country his debtor. This was good reason enough, but the fact that he is the head of the great Dunlop Rubber organization may have been another.

It is self-evident that in the 25th year of the life of the Institute we have reached a point when some kind of entente with the rubber industry, so far as education is concerned, will be reached. We urged it first in these pages in January, 1953, and perhaps it was our reasonings that created the official interest today. Be that as it may, Lord Baillieu's speech at the lunch was wholly confined to the urgency of the matter. The two industries, he insisted, had converging interests, in education and in standardization while the chemistry and technology overlap. In this

highly competitive world we cannot afford unnecessary duplication whether it is in the realm of education or in the conservation of manpower and finance. The time is coming to co-operate.

Mr. Harold Lusty's reply to the effect that the Council of the Institute was already actively discussing the problems entailed by close collaboration and that he doubted whether the appropriate Ministry would welcome a separate technical college, was very much to the point.

Moulding Powder and Shot

Tell the Chemical Engineer

I recently had occasion to talk with somebody about a process in which a liquid is mixed and reacted at 150° C. with a heavy powder in a round bottomed steel mixing vessel. The steel agitator is of the well-known anchor-shaped " scraper " type, its function being to keep the heavy powder from settling and sticking to the bottom by rapid rotation. In fact the scraper arm never really scrapes, as the blade must not be made to touch the bottom of the mixer; which is fair enough for scoring would take place between metal and metal. A clearance of about $\frac{1}{8}$ in. is always allowed to prevent damage, which in an autoclave might prove serious. The result, in the job I saw, was that some of the heavy powder did not react with the liquid or remained on the bottom of the vessel. I suggested putting a long sliver of polytetrafluorethylene or small $\frac{1}{8}$ in. thick blocks of it, staggered at a few points, along the bottom of the agitator blade to close the gap. It would easily stand up to 300° C., and since p.t.f.e. is relatively soft and indeed also because its coefficient of friction is so low, no damage would be done to the steel body. This type of scraper agitator would probably find use with advantage in many mixers, reactors, Dorr thickeners, etc.

* * *

Down the Hatch

Plastic bottles are all the go as we well know and they're in all shapes and sizes. But this one is the biggest ever, nobody else has made one in the same shape and it's certainly going places during its life. In other words it's quite unique. What is more, it was sent round to my office especially for my inspection by my old friends the Basses, which was a very nice gesture. A wave of bitter-sweet nostalgia pours over me for it is well over 25 years ago that I was invited up to that tiny country hamlet Burton-on-Trent to be shown how beer—well, perhaps I should say Bass, is made. I well remember staying at the delightful old-world hostelry the Station Hotel and from my bedroom window looking down the High Street stretching away so straight with nothing but breweries on either side, with the brewery railway lines connecting them every 50 yards or so. So fascinated was I, that through the night I watched and listened to the sweet music and gentle clank of the engines and trucks moving between, carrying the nectar of the ancient British gods. It was very moving. Anyway, here's the plastic bottle and I give you one guess only—what's it made of ? Good show ! You've guessed it in one. Who made it ? Why, it was Seddon Diesel Vehicles Ltd., of Oldham, and very beautiful it looks too. No, it won't be used to hold beer as it would leak out through the windows and door. It's a wonderful advertisement for a wonderful beer.

* * *

Roll out the Barrels

The big injection machine at Halex reminds me of a problem put to me during or shortly after the war by somebody up at the Ministry of Agriculture and Fisheries. They were worrying about the herring industry or rather the then shortage of barrels for the fish. I suggested welding them from polythene sheet which could easily stand the temperature of salt-ice frozen fish without cracking and could possibly be returnable flat by slitting at three lines and re-welded if an efficient welding organisation were available. This seemed a bit too much for the Ministry, but today the problem would seem more possible by injection moulding, although the matter of dealing with empties does not seem such a bright idea. However as so much goes to Russia, they could be returned full of caviare and kind words.

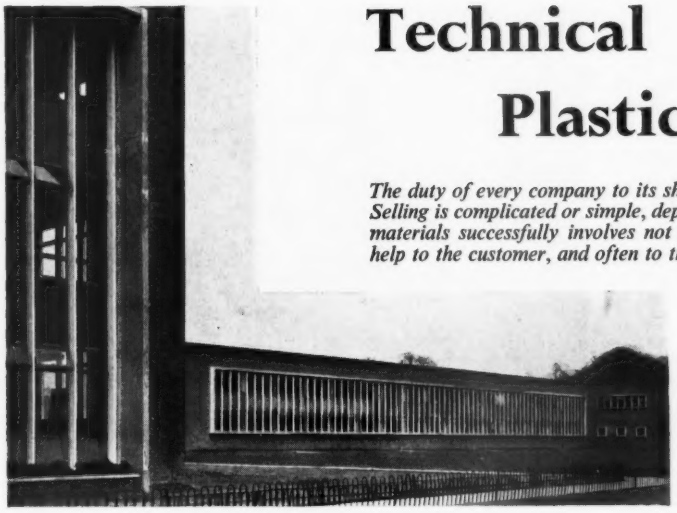
* * *

Vive le Sport!

Here below is a sight to stir the hearts of all lovers of the noble art of self defence and of those who, like me, remember as if it were to-day, the great fights of yesterday: of Dr. W. G. Grace v. Tom Belcher at Glyndebourne, of Errol Flynn v. Dorando on Daytona Beach, of Little Mo v. Sir Francis Drake at Lord's, of my uncle, Lancelot (Slush) Dogsboddy v. The Crown at the Centre Court, Old Bailey, and of Lord Derby's Hyperion v. Ruy Lopez' Gambit at the Cirque D'Hiver, Paris. And now we have in the direct line of descent from those Giants of the Past, the 1956 winners of the P.I.G.S. contest for the famous 2-gallon " Plastics " cups (cunningly miniatured to get into the picture) loaned for the occasion by Mr. Attenborough with kind permission of Temple Press Ltd. On our right, John Davie of The Hadley Co. Ltd., and on our left Finlay Walls of I.C.I., both as fresh as paint and almost as sticky, after their tremendous 18 round foursome at Sunningdale on July 25. Their cue work during the last chukker, with only one racket left between them was a thing to be remembered for all time. Their exhausted opponents were removed on stretchers to the local Women's Institute long before the end. And who is that noble, bearded figure between ? Why, it's the all-knowing, the prescient, the ineluctable, the Big Brother of Plastic Sport, your old friend and stable companion DOGSBODDY.

Technical Service in the Plastics Industry

The duty of every company to its shareholders is to make and sell its products at a profit. Selling is complicated or simple, dependent upon the nature of the product. Selling plastics materials successfully involves not merely an exchange of documents and currency, but help to the customer, and often to the customer's customer as well. This has been broadly defined as "technical service." The nature and scope of technical service is briefly reviewed by the staff of "Plastics" in the following article.



(Left) View of the research and technical service block of the Distillers plastics companies at Barry.

THE early structure of a raw material manufacturing organization was based on three departments, sales, production, and research. Research began by being the poor relation, until management realized the full limitations of the then available plastics materials, principally phenolics, cellulose nitrate, casein, shellac and ebonite.

The first major step forward was the decade that saw the discovery or commercial application of urea-formaldehyde, cellulose acetate, polythene, and p.v.c. Particularly in the case of the last two materials, the research factor of the plastics industry played an all-important part, and this it has continued to do, on an ever-increasing scale, yielding up the polyamide, polystyrene, melamine, epoxy, and vinyl acetate materials, to name only a few.

Most of this research was, and is, carried out by a relatively small number of companies. Fundamental research involves immense capital expenditure, and fewer than 20 chemical companies in the whole world have found it possible to play a major part in this work. Such companies include DuPont, I.C.I., Badische Anilin, Péchiney, and B. F. Goodrich.

Fundamental research is, of course, a protracted business, involving the co-ordinated efforts of chemists, physicists, and engineers, most of them trained to work in a special way. With the growing usage of plastics, it was found that these men and women were increasingly being asked to work on strictly *ad hoc* problems, more related to fabricating techniques and applications than to basic problems of chemical structure and synthesis. In short, the research units were posed problems which interfered with the long term programmes in hand, and which required for their solution apparatus and techniques outside the brief of the research departments. At this point in time, "Technical Service," or "Application Research," was born.

Technical service is founded on three important basic facts; the plastics industry is a highly technical one, many of the constituent companies are small and lack adequate technical facilities of their own, and plastics, improperly used, can retard rather than accelerate sales. With these three points in mind, it is not surprising that the leading raw material manufacturers in Britain, America, Germany and elsewhere have developed technical service to the point where it is now a major factor in sales programmes. It is also responsible, in no small measure, for the rapid growth in the use of plastics, as will be seen later.

This fourth factor, common to virtually all raw material manufacturing organizations, exists in many forms. In its most limited guise it merely helps a customer solve a difficult problem. At its widest it may employ 200 or 300 people in a single company, cost several hundreds of thousands of pounds a year to run, and yet show a handsome dividend in increasing total sales. Its boundaries are diffuse and sometimes difficult to see, especially where it merges with the sales unit, and its links are close with both production and research.

However, technical service in the completest sense is capable of fairly clear sub-division, as follows:—

(1) Technical service to the customer.

(2) Development of new product uses.

(3) Education, used here in the broadest sense to cover propaganda by leaflets, abstracts, lectures, demonstrations, and films.

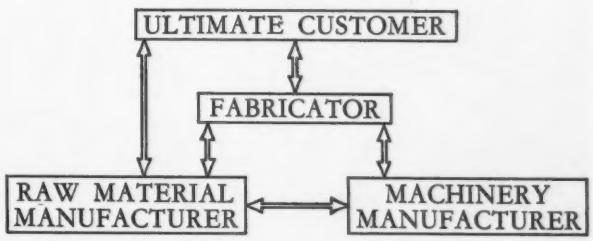
(4) Testing and evaluation of plastics.

Under these four broad headings a multitude of specialist tasks are carried on, and if we consider briefly some of the more important developments we shall be somewhere near portraying the true functions of technical service.

Technical Service to the Customer

This is the most easily defined part of the work of a Technical Service department, since it is directed solely to assisting the fabricator to do a particular job. The fabricator, as the immediate customer of the raw material manufacturer, may frequently need to fall back on the resources of a technical service department for the solution of a particularly difficult problem.

The following diagram may help to make clear the special responsibility of the raw material manufacturer.



It will be seen that, like the fabricator, he must be interested in the success of three parties, ultimate customer, fabricator, and machinery manufacturer. The close liaison between raw material manufacturer and machinery manufacturer is specially noteworthy in Germany, where development of a new material is accompanied by machine modifications so that when the material is ultimately offered for general sale, equipment that will handle it is ready to hand.

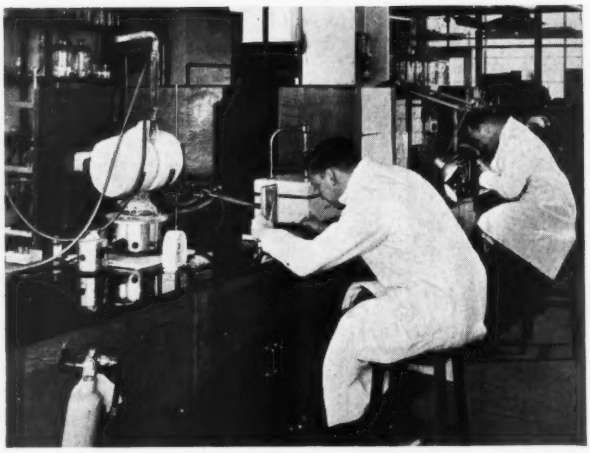
In so far as the ultimate customer is concerned, the raw material manufacturer has the opportunity of direct liaison, helpful to both parties alike. The Plastics Division of I.C.I. for example, has for many years worked closely with local authorities and other interested bodies in the evaluation of polythene for cold water piping. From this work, which has included field trials, lectures, and exhaustive tests, has emerged standard specifications (formulated by the technical committees of the British Plastics Federation), acceptance by planning officials, and a direct increase of business of benefit to both I.C.I. and many tube extruders. Similarly, British Industrial Plastics Ltd., have spent a great deal of time and money in interesting the catering trade in melamine tableware. These projects are frequently so large that only the resources of a major industrial concern are sufficient, but successfully executed they bring about substantial business for the moulder and fabricator.

Another interesting aspect of this work occurs when the ultimate consumer becomes, in effect, the fabricator as well. An instance of this kind occurred when I.C.I. investigated Perspex as showing promise for aircraft canopies. The Technical Service department did a great deal of work, and the aircraft industry was finally approached and asked to evaluate the samples offered. There followed a close association between the aircraft companies and I.C.I., which resulted, after many modifications to the material, in a grade of Perspex which was subsequently used in very large quantities for canopies and blisters.

The majority of technical service department work is done, however, in direct contact with the fabricator. The range of problems is endless, and no two are alike.

Generally speaking they fall into two main groups; investigation of difficulties encountered in using the material concerned, and the study of problems posed by the ultimate customer.

In the first category a typical example is the cable manufacturer who, some years ago, ran into trouble with a particular raw material manufacturer's p.v.c. He was using some 20 tons a month. The sales department of the p.v.c. manufacturer was suddenly asked to take back a consignment of 10 tons, and told that no further orders would be placed. A representative of the technical service department, having experience in cables, was sent up to the cable works and was received in an atmosphere of some hostility. He was told that the material was unworkable. After some very hard persuading he got the management to agree to let him try the material for himself. Working with poor equipment, for the extruders were short barrelled rubber machines, he finally got the plant running and was able to show that his company's p.v.c. compound was up to specification. In fact, he was the first representative of his company to be allowed



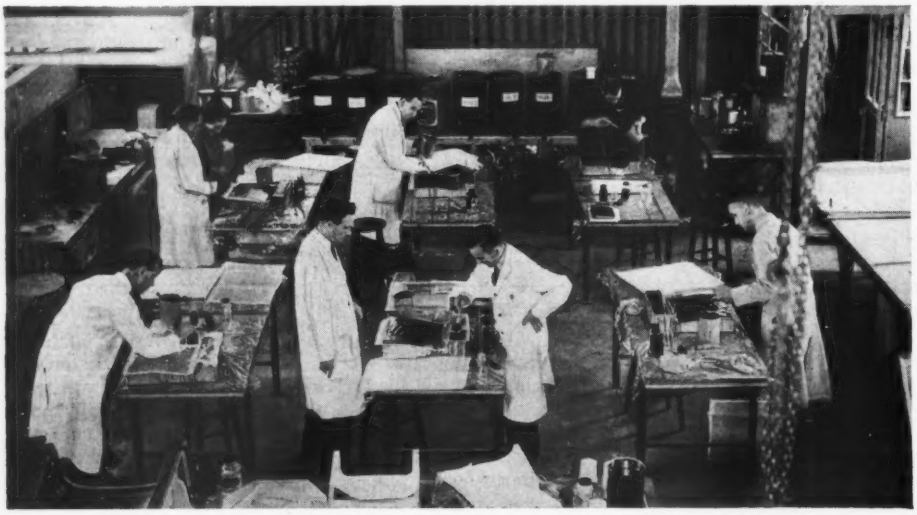
Measuring the volatile content of Styron moulding powder at the technical service and research laboratories of Distrene, Ltd.

in that particular factory, and relationships thereafter were much more cordial.

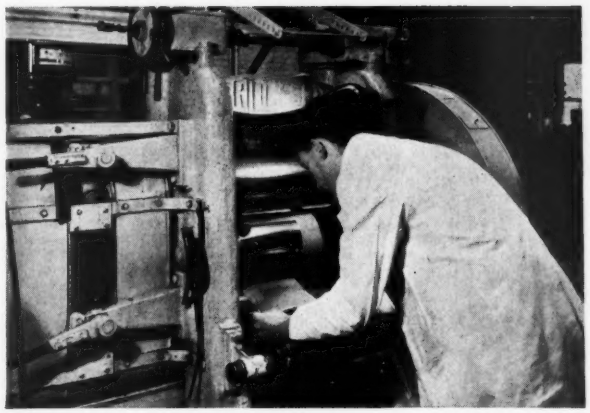
This raises the question of secrecy, probably the biggest hindrance to the success of a technical service department. The material manufacturer stands in relation to his customer on much the same basis as doctor and patient. There must be mutual trust, and material manufacturers would be quick to release any member of the technical service department who reported to one fabricator what he had seen in the works of another.

Technical service can only work well if complete information is disclosed by the customer on his problem. He is wise if he takes the representatives of the technical service department completely into his confidence, since he will find that a great deal of valuable information, relevant to his type of work, is available to him.

The help given by the technical service department is charged for, in any event, as a proportion of the cost of materials, and one might as well have what one has paid for. Nevertheless, help is given to a company, even where the possibility of material sale is slender. An instance of this occurred recently in Europe, where a company set out to make a p.v.c. product. The European agents of the p.v.c. manufacturer suggested that for goodwill of possible value for the future, a member of the foreign company should visit the technical service laboratories in England. Although Government restrictions made it impossible for the



A view of the new polyester training school, set up by B.I.P. Chemicals, Ltd., and the subject of detailed comment on pages 186–187 of this issue. This represents one very important form of technical service.



Testing p.v.c. calendering properties in the Technical Service department of I.C.I. Plastics Division, Welwyn Garden City.

company to import British p.v.c., a representative was brought to this country and trained in manufacturing techniques. This is an example of long term investment which only becomes possible when the raw material manufacturer has brought his technical service department to a high level of development.

At this point it may be convenient to outline the structure of a typical technical service department. Briefly, it may comprise a staff of as many as 250 men and women, most of whom are graduate chemists, physicists and engineers. Graduate and non-graduate staff are grouped together to form small research cadres, many of which are specialist; one may concern itself only with compression moulding, another with extrusion, a third with vacuum forming. Facilities will include a complete range of standard fabricating equipment, so that any problem can be investigated under working conditions. In addition, a great quantity of ancillary equipment will be available, both scientific and technological. A library and information unit, a demonstration laboratory, and even full-scale teaching facilities will be included. It may all cost from £25,000 to £250,000 a year to run, and it will be worth every penny of it.

Development of New Product Uses

If we may refer again to the diagram on the previous page, the reader will note the direct link which frequently occurs between the raw material manufacturer and the ultimate customer. This is capable of further extension, in that the material manufacturer is frequently responsible for initiating a demand for a particular product, resulting usually from the cross-fertilization of ideas between industry at large and the technical service department. This peripheral work is perhaps best evidenced in the development of Perspex and melamine, already noted above. It is worth stressing here, however, that in no small measure the rapid development of the plastics industry in the last 20 years is due to the technical service department. Very few fabricators can afford to set aside time and money for what is to them basic research. Long range stimulation of markets by direct contact with the ultimate customer, publicity, exhibitions, and the like, all initially undertaken by the raw material manufacturer, bring business back to him, and in so doing to his immediate customer, the fabricator. This is one of the developments that has helped to break down the old-established secrecy barrier between material supplier and moulder.

Education and Propaganda

Here the raw material manufacturer makes a two-pronged attack, on the fabricator and on the public.

Each time a new material is developed, the plastics industry comes under the fire of the technical service department. With nylon, for example, many aspects of injection moulding had to be re-studied. The work of Griffiths of I.C.I. on injection moulding techniques may well rank as classical research in technology, now bearing fruit in the intensive courses at Welwyn for moulders. These enable the moulders and technical service personnel to come together under informal conditions and offer the moulder a unique opportunity of both gaining and imparting knowledge, pooling experience, and so facilitating the full exploitation of a new injection moulding composition.

Likewise the school set up by British Industrial Plastics to train personnel to make efficient glass-reinforced polyester structures is symbolic of the material manufacturers realization that teaching people how is one of the best investments for the future.

For the public, a different approach is required. We have a long way to go yet to overcome the bad impression left behind by the shoddy products of yesterday. Technical service therefore provides the lecturer to talk to women's institutes, trade conventions and the like, explaining what plastics are, how they are made, and what you can and cannot do with them. In this way, with the aid of talks and films, the public become conversant with plastics, and do not so frequently expect them to do impossible things. Realization dawns that in the same way, but for slightly different reasons, you do not expose glass and polythene to naked flames, because if you do you spoil them.

Lastly, under the heading of education, mention must be made of technical literature. Guidance in the form of booklets and manuals is one of the most important ways to keep the fabricator up-to-date. The technical level of these manuals is now very high, and the wealth of data they contain is of course the work of the technical service personnel, who have evaluated the materials on full scale equipment.

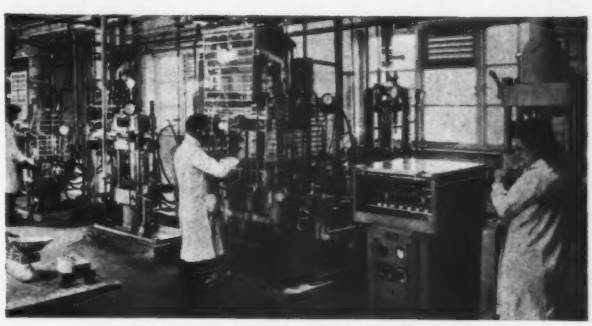
Testing and Evaluation of Materials

The availability of full scale equipment in the technical service department not only furnishes information for the manuals noted above, but also permits the evaluation of competitive materials, and the checking of customers' complaints. For example, a material may be found to be giving trouble, reported by a number of moulders. The technical service department can and does take back samples, and with the accurate equipment available, can report any wandering from specification on the part of its production department. Here, of course, technical service works closely with production, and is thus able to spot a plant deficiency before too much damage has been done. If exhaustive tests show the material to be " on specification," then help and advice may be given to the moulder, whose moulding conditions may have wandered.

Conclusion

The plastics raw material industry is not of course unique in the high standard of technical service it gives. Both the machinery manufacturer, and more especially the moulder and fabricator, offer technical service to the customer of a most important type. This, however, is another story, one which the staff of *Plastics* hope to relate in detail at some future date.

C.W.W.



Compression moulding equipment at I.C.I., Welwyn.

Polyester Training School

(Left) Lecture on the hand lay-up technique in the polyester school.

In the June issue of "Plastics" (*pages* 105–107) *we published a review of progress in glass fibre/polyester technology. That article, which aroused wide interest, stressed the importance of systematic training of personnel if the basic requirements for glass fibre structures were to be met. With great pleasure we publish the report below on the training school set up by B.I.P. Chemicals Ltd. for just this purpose. This school is possibly the first of its kind in the world designed to implant in the minds of workers in this field the necessary facts and techniques called for in the manufacture of high quality products.*

IN recent years the use of polyester resin/fibrous glass composites for the moulding of numerous articles has shown a marked increase. As the techniques used in this moulding are relatively new, it is the opinion of B.I.P. Chemicals Ltd. that in order to assist fabricators to take advantage of the numerous possibilities of these materials, it is necessary to have means whereby the various moulding techniques can be passed on to personnel engaged in resin/glass moulding. A one-week training course is therefore held at monthly intervals, at Oldbury, in which representatives of fabricating companies are taught both the basic principles and the latest development in resin/glass moulding.

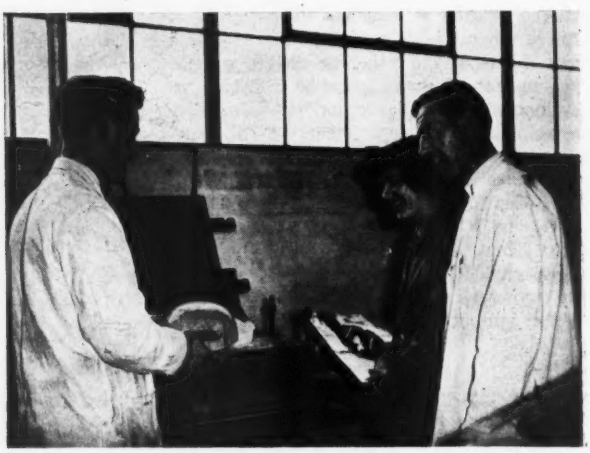
The training course, which is held under the ægis of the Chemical Development Department, is essentially of a practical nature. Trainees may take either a general course, or concentrate on one of the main sections, namely hand lay-up or contact moulding, flexible bag moulding, gunks or premix components, and preforms and matched metal moulding. A brief outline of the points covered in each of the various sections is as follows.

The hand lay-up lectures cover the types of polyester resins and thixotropic pastes available, and the applications for which they are formulated. Samples of the various types of glass fibre reinforcements are shown and the advantages and disadvantages of the various chopped strand mats and resin cloths outlined. The effect of different catalyst and accelerator additions on both the gel time and the time taken for a moulding to attain a reasonable state of cure are discussed. Suggestions are made on a suitable organization for a moulding shop, particular emphasis being placed on methods for obtaining the highest possible production rate per mould. The various methods of mould construction are then examined, reference being made to the advisability of endeavouring to minimise the amount of after work required on the moulded article. The methods of incorporating reinforcing ribs and metal inserts during the moulding operation are also outlined.

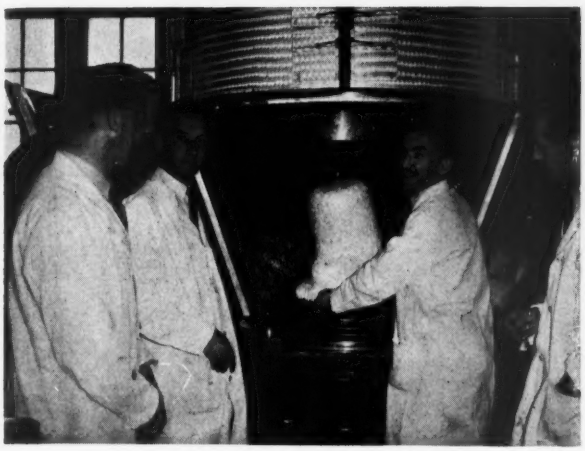
Facilities are available for the trainees to prepare mouldings by the hand lay-up method, using either aluminium, resin/glass, or steel moulds. The mouldings produced incorporate ribs and any metal inserts that are of particular interest to the trainees.

The lecture and demonstrations on flexible bag mouldings covers the principle of this type of moulding with reference to the type of article that can be produced. The methods of producing flexible bags and methods to prevent the sticking of the bag to the moulding are discussed. Following this, the types of material and method of construction of the rigid section of the mould are outlined, with suitable methods of heating the mould. Moulds

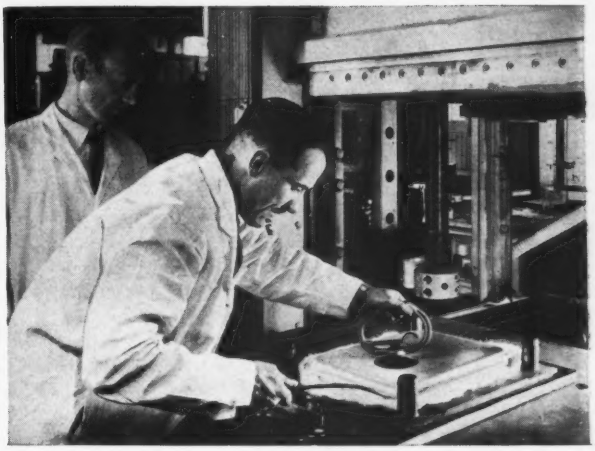
Demonstration of moulding by the matched metal moulding process.



Demonstration of rubber bag moulding for motor cyclist's crash helmet.



Removal of preform from preforming machine.



Removing cured moulding from 150 ton Bipel press.

are available for trainees to carry out practical work on the production of mouldings by this technique.

The section of the course dealing with premix components includes lectures on the type of resins, insert fillers, and fibre reinforcements that are used together with details of types of mixing equipment required. Facilities are available for trainees to prepare and mould various types of gunk mouldings.

Instruction in the making of preforms and the consequent moulding of these is extensively covered. The lectures include details on the use of both emulsion and dry preform binders and on the methods of obtaining an even distribution of chopped glass fibre on to the preform screen. The basic principles of matched metal moulding are discussed, emphasis being placed on the advisability of using a mould with the correct shear cut-off clearance and of adjusting the speed and duration on the slow close of the press to suit the mould in use. At present the trainees can carry out matched metal moulding using glass mat as the reinforcement. However, within a few weeks facilities will be available for both glass mat and preform moulding.

A special feature of the equipment is the fully automatic preforming machine manufactured in Germany by Friederich Busch. This equipment will be the subject of special comment in a future issue of *Plastics*.

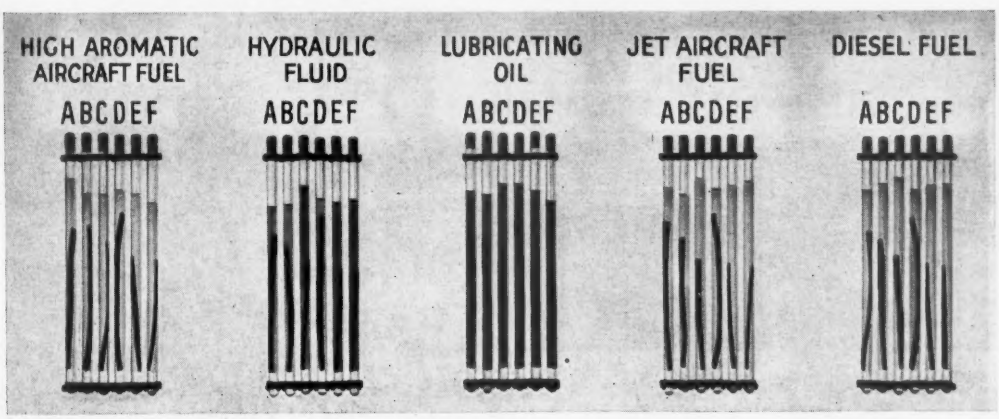
During the course the trainees are encouraged to ask any questions on points that they have not completely understood. Further to this the personnel of B.I.P. Chemicals Ltd. will endeavour to assist the trainees in the solution of any moulding problems that are pertinent to the type of moulding carried out at their various firms. The questions asked are not only of interest to the customer, but are of value in that an indication of the various applications and techniques required is obtained.

Butadiene — Acrylonitrile Rubber

IN the July issue of this journal we announced the production by I.C.I. (Plastics Division) of the " Butakon " series of synthetic rubbers, all copolymers of butadiene with styrene or methyl methacrylate or with acrylonitrile. The first two, Butakon S and Butakon M show outstanding interest for rubber-reinforcement and film-forming respectively and will therefore be mainly absorbed by the shoe-sole industry in the case of the styrene copolymer, and by the paint industry in the case of the methacrylate polymer. The Butakon A type, the acrylonitrile polymer, holds a special interest since it is exceptionally oil resisting, indeed even more superior in this characteristic than the well-known chloroprene rubbers, to a very wide range of liquids. The technical value of this type is thus exceptionally important.

The " chart " below is a photographic reproduction of a series of different synthetic rubbers and of natural rubbers contained in test-tubes holding a variety of oils and liquids. The effect on the rubbers is self-evident. The following table shows the effect of increasing the acrylonitrile content in a butadiene-acrylonitrile polymer on its resistance to swelling in hot oil. The volume of swell of a carbon black compound was measured after immersion in TSD 412 oil for 72 hours at 100° C. according to A.S.T.M. D471–51T.

% Acrylonitrile Content	% Volume Increase
20	60
25	33
28	25
32	18
38	13
45	10



Resistance to fuels and industrial liquids

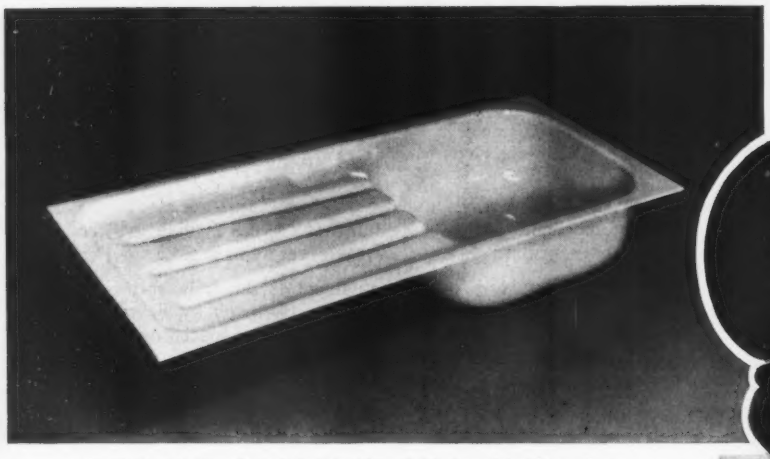
A. Natural Rubber
B. GR-S
C. Neoprene
D. Butyl Rubber
E. I.C.I. Medium Nitrile Rubber
F. I.C.I. High Nitrile Rubber

PLASTICS
IN THE SERVICE OF MAN

A pictorial review of high-quality units moulded or otherwise fabricated in Great Britain . . .

67. Caravans — II

A list of trade-marks and companies mentioned in this review, with full names and addresses, appear on page 202



(Above) Moulded sink and draining board fabricated by Arnoplast Ltd. from Perspex.

(Right) Racasan portable toilet with phenolic lid and seat moulded by Universal Metal Products Ltd. The unit is also fitted with nylon hinged brackets to fit the lugs of the container, hinge retaining clips and screws.

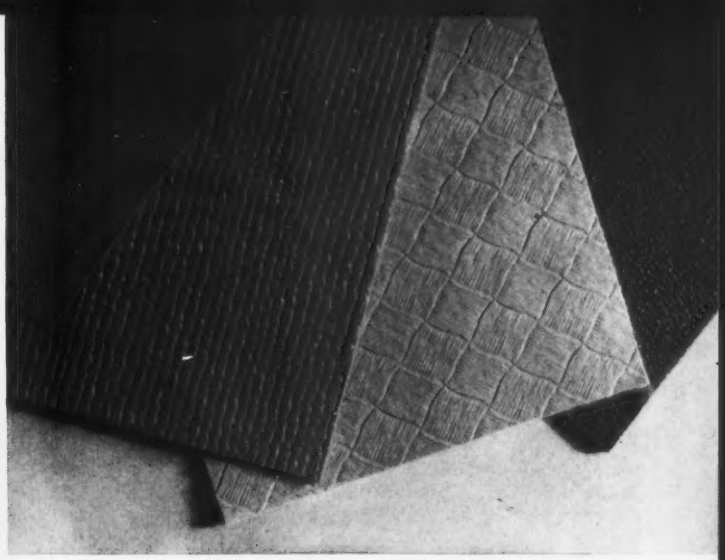
(Above) Perspex cupboard and washboard in a caravan constructed by Coventry Steel Caravans Ltd.

(Above) Tableware moulded from Beetle melamine powder by J. S. Peress Ltd.

(Right) The kitchen of a living van which has the ceiling and walls panelled in buff onyx Formica. The van was made by E. J. Mills.

upboard
caravan
oventry
Ltd.

(Above) Kitchen unit of the Car Cruiser Mayfair '55 made by O. G. Lywood Ltd., veneered with buff lynette Formica. (Photo by courtesy Ideal Home.)



(Above) Hardura p.v.c./felt floor covering.

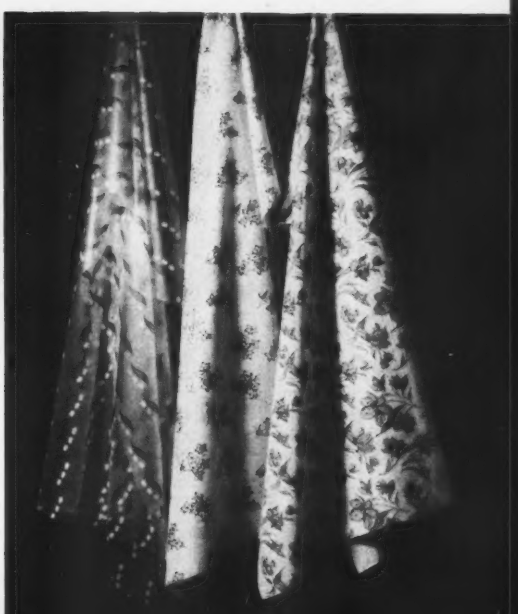
(Above) A caravan bath moulded in Perspex by Arnoplast Ltd.

(Left) Melamine ware in Beetle melamine moulded by Streetly Mfg. Co. Ltd.

(Left) Polythene bucket moulded by Fraser & Glass Ltd.

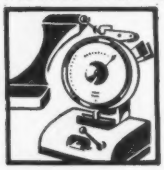
(Above) Sink unit and draining board moulded by Universal Metal Products Ltd. in glass fibre reinforced polyester resin.

(Right) Velbex p.v.c. curtain material.



World's Industry Employs Plastics

MATERIALS and TESTING



Plastic coverings for metals. — L. Werthmueller gives a survey of the present techniques in the technical application of plastic coverings using either flame spraying or "wirbelsintering," the latter being a German development. The latter method does not need a vibrator as in the flame spraying method.
(*Technische Rundschau* (*Berne*), 1956/June 1/2.)

Plastics for protection against acids.—Some plastics have properties which make them more suitable for protection against acids than metal alloys or inorganic materials. A table gives the most important types of plastics for this purpose and their behaviour against chemicals and the highest permissible operating temperatures.
(*Chemie-Ing-Technik*, 1955/596.)

Ageing tests for plastics.—F. W. Reinhart and M. K. Mutchler used fluorescent sunlamps. They have the following advantages over S-1 sunlamps: They are cheaper and can be used for a longer period. No special fixtures are required. The temperature of the plastic test specimen can be controlled more readily because of low output. Larger areas of material can be exposed; tested areas are more uniformly radiated and deteriorated.
(*ASTM Bulletin*, 1956/Feb./45.)

Corrosion tables of non-metallic materials.—F. Ritter has recently compiled tables of the corrosion behaviour of non-metallic materials including plastics arranged according to the corroding materials. They list more than one hundred corroding materials and besides plastics, glass, wood and building materials are considered.
(*F. Ritter Korrosionstabellen nichtmetallischer Werkstoffe*, 1956/May. Springer-Verlag, Vienna.)

Ethylene polymers.—A newly developed type Marlex has several advantages over conventional polythene and is able to extend their range owing to (1) increased softening temperature, (2) improved abrasion resistance, (3) extended environmental stress cracking time, (4) decreased permeability to liquids and gases.
(*Wire and Wire Products*, 1956/June/661.)

Polypropylene.—A short article on the history and properties of polypropylene as produced by Montecatini has been published. Among the reported properties is a melting point of 320° F. and a very good resistance to organic solvents. Polypropylene is regarded as the first of a new class of polymers which have an exceptionally regular type of structure. It is made by a low pressure process employing a heterogeneous catalyst which is a combination of a metal alkyl and a metal halide.
(*Chemical & Engineering News*, 1956/June 18/2980.)

Heat resistant thermoplastics.—American Cyanamid have entered the thermoplastic field with two new materials recently exhibited at the National Plastics Exposition. Cymac 400 is an injection moulding compound based on methylstyrene and is reported to have withstood repeated extended exposure at 212° F. without any apparent distortion. The other compound, Cymac 201, is based on methylstyrene-acrylonitrile copolymer.
(*Chemical & Engineering News*, 1956/July 9/3392.)

INDUSTRIAL APPLICATIONS

Epoxy resins for sealing porous castings.—H. Grosch and collaborators have developed a new method for sealing castings which is described in detail. However, the method should not be used by the foundry as this may lead to the supply of faulty castings.
(*Maschinenbautechnik*, 1956/March/113.)

High-strength adhesives for metal-bonding.—R. F. Blomquist has prepared an engineering review of current requirements for adhesives, bonding-process specifications and joint design. The common advantage of joint design are clearly pointed out.
(*Machine Design*, 1956/May 31/99.)

Vinyl tube guide terminals into printed circuits.—An automatic inserting machine positions terminals into printed circuit boards in any pattern using flexible vinyl tubes to carry the pin into the desired position.
(*Design News*, 1956/Feb. 15/28.)

Truck rims protected by epoxy resin.—Firestone Steel Products Co. have selected an organic finish Perma-Plate to protect truck rims against water, road salts, corrosion and abrasion.
(*Automotive Industries*, 1956/June 1/64.)

Non-lubricated spherical bearing.—A new development for an automobile suspension joint is the use of Teflon fibre woven into fabric to face the joint. Other frictional applications of Teflon are under development.
(*Automotive Industries*, 1956/June 1/34.)

Developments in packing and gasket materials.—R. H. Koch demonstrates clearly the role of fluorocarbon plastics and other new elastomers as modern gasket materials. Requirements for heat and cold resistance, chemical resistance and life are tightening up.
(*Machine Design*, 1956/May 31/117.)

German plastics exhibition review.—A review of some of the more interesting developments in the German plastics industry as exhibited at the recent 1956 Hanover Fair, is given by Dr. Josef Hausen. Included in the review is some notes on machinery and fabricating equipment which was shown.
(*Kunststoffe*, 1956/July/307.)

Plastic welding of watchstraps and cases.—Special electrodes for high frequency plastic welding apparatus have been developed, to carry out the operations economically.
(*Feinwerktechnik*, 1956/Feb./66.)

MISCELLANEOUS USES

Dry cleaners use plastics.—Garment bags of polythene are improving customer service for such establishments as dry cleaners, hotels, retail shops and other stores, where they serve both to keep garments clean and as an advertising medium, while providing the customers with a bag that can be used again and again.
(*Canadian Plastics*, 1956/June/84.)

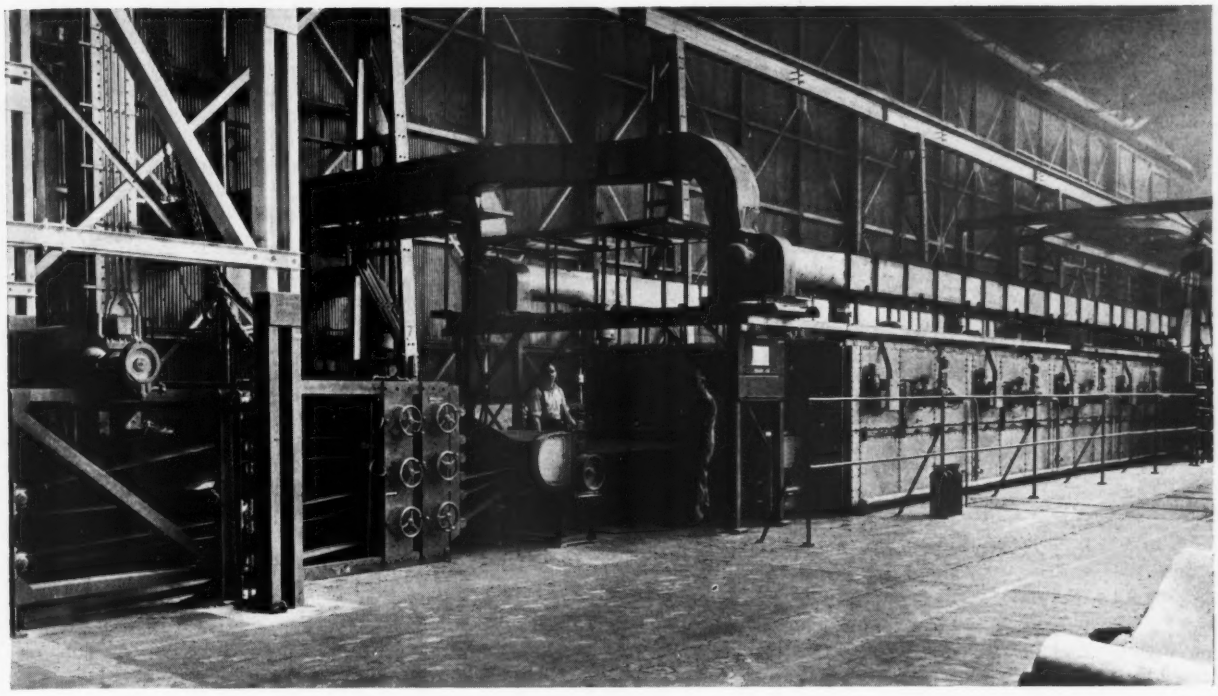
New packaging concepts with cellulose acetate.—A survey of the use of acetate in packaging and lists the special properties of the material making it suitable for this purpose. Applications discussed include the packing of food, fruit, hardware, pharmaceuticals, and toilet goods. Blister packs attached to cards for such items as ball point pens have been found to reduce pilfering in stores.
(*Canadian Plastics*, 1956/June/96.)

Plastics food packets.—A brief survey of some of the latest moulded and formed food packages is given. Also mentioned are film wraps. It is expected that food packaging will provide one of the biggest markets for plastics materials in the near future. By virtue of its attractive appearance and hygienic properties it is already well established.
(*Chemical & Engineering News*, 1956/June 25/3180.)

Asbestos-reinforced low pressure laminates.—Attention is drawn to phenolic-impregnated asbestos sheet material which has been in use for a decade in England and recently introduced by three firms in the U.S.A.
(*Materials and Methods*, 1956/Feb./103.)

Reinforced polyester products.—An article deals with some of the industrial applications of glass reinforced polyester resin and particularly with containers and trays. Properties and a general discussion on the material and its application is included in the article.
(*Materie Plastiche*, 1956/July/551.)

Epichlorhydrin resins.—Article by M. Rivat-Lahousse deals with the properties, applications and methods of fabrication of the epichlorhydrin resins. Sections of the article deal with the resins' use as an impregnant, its use in the making of casting moulds and as a protective coating.
(*Industrie des Plastiques Modernes*, 1956/June/1.)



Progress in P.V.C. Mine Belting

A report on the work now in progress at the Speke factory of the Dunlop Rubber Company in the manufacture of belting for the mines.

THE biggest single outlet for p.v.c. is now in non-inflammable conveyor belting for the mines. This phenomenal growth has taken place since 1952, when full-scale production was first commenced, and whilst the demand has steadily grown in each successive year, manufacturers of p.v.c. belting have not ceased to study methods of improvement both in belt construction and performance. It is therefore apposite to review the developments that have taken place, particularly since the publication in the December (1954) issue of *Plastics* of a complete description of manufacturing and testing techniques at the Wellingborough Works of Rubber Improvements Ltd.

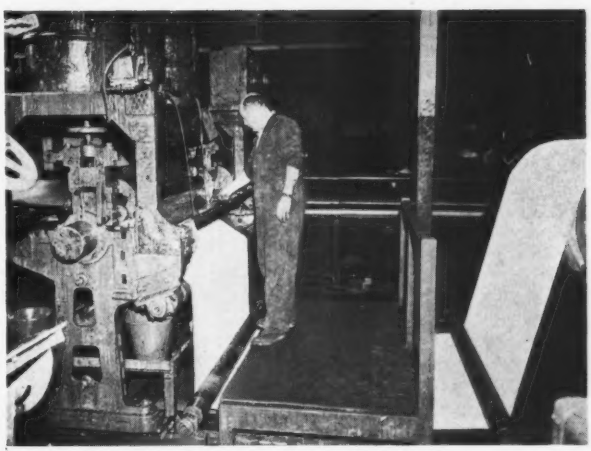
To recapitulate briefly, p.v.c. mine belting is manufactured by either spreading or calendering p.v.c. to high quality duck, subsequently laminating the p.v.c. coated fabric by either a Rotocure machine, or by pressing, to give a 2, 3, 4 or 5 ply belt. This is then edged, again with p.v.c., and following testing, is ready for dispatch. Throughout the whole process the greatest care is taken to meet the rigid specifications laid down by the National Coal Board. This belting is, because of the vital part it plays underground, a precision product of the highest order.

During a recent visit to the Speke, Liverpool, factory of the Dunlop Rubber Company, we were able to study the production techniques employed there and, equally important, to discuss with Dunlop executives the extensive development work now in progress which is expected to improve the colliery belting both from the point of view of performance and safety. The research is directed both to the raw materials, p.v.c. and duck, and to the processing techniques. The major topics under consideration are duck construction and strength, static electrical build-up, friction characteristics and improved resistance to mechanical damage.

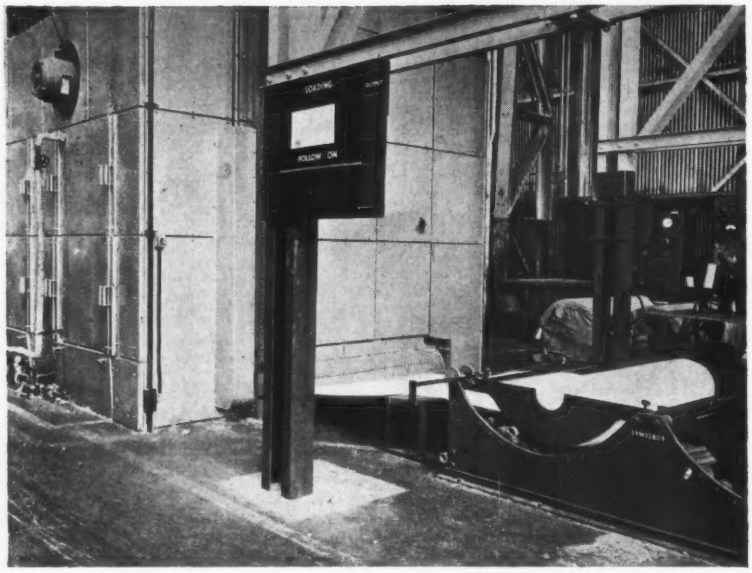
Fabrics

The suitability or otherwise of duck for reinforcing mine belting depends primarily upon the structure of the duck itself, and then upon the pre-drying and fusing processes that are employed. Before the last war, a variety of fabrics were in use for belting manufacture, but steps were taken during the war to standardize types of fabric. This resulted in the publication of a British Standard on cotton belting ducks, which is still adhered to, although there is still scope for further development.

In some cases the types of fabric used in rubber belting were not entirely suited for incorporation in p.v.c. belting. This led the Dunlop organization to consider a programme of development on fabrics, particularly suitable for p.v.c. belting. In conventional type ducks the warp to weft strength ratio is of the order of 2 : 1.1, which in effect constitutes a waste as it is in the warp direction, i.e., direction of movement, that the strength is particularly required.



Spreading p.v.c. paste on to duck.



Pre-drying equipment at Speke for duck, used in the manufacture of p.v.c. belting.

At Rochdale, one of the allied Dunlop Companies manufactures belting duck, including the Extron range of fabrics which have been specifically designed for belting, under the development programme. Here the warp strength has been increased by 250% and the weft strength has remained approximately the same. This gives a warp to weft strength ratio of approximately 4 : 1 and has been achieved with an increase in weight of less than 100%. Rayon is used for the warp and cotton for the weft. The advantages of this duck, in addition to the more satisfactory strength distribution, are better troughing characteristics, i.e. the belt sinks into the guide rollers, and better adhesion to the pulleys. This rearrangement of strength distribution means that three plies of Extron fabric can replace five plies of conventional fabric. Belts of this type are now on trial with the N.C.B.

Finally, the work at Speke and by the fabric subsidiary seems close to solving the problem of damage to belting which, strangely,, is most commonly caused by tearing. The new types of fabric exhibit much greater tear resistance and are therefore expected to increase the service life considerably.

FRICTION CHARACTERISTICS

Dynamometer tests show that the friction between a p.v.c. belt and a steel pulley is higher than with a rubber belt, under all conditions, but particularly in the wet. Changes in the coefficient of friction between p.v.c. and steel are shown by the following table:—

Compound	Polymer/Plasticizer	Type Plasticizer	
A	55/45	D.A.P./T.T.P.	0·98
B	55/45	D.A.P./T.X.P.	1·10
C	55/45	D.A.P./T.T.P.	0·87
D	50/50	D.A.P./T.T.P.	1·09
E	50/50	T.T.P.	1·80
F	45/55	T.T.P.	2·30

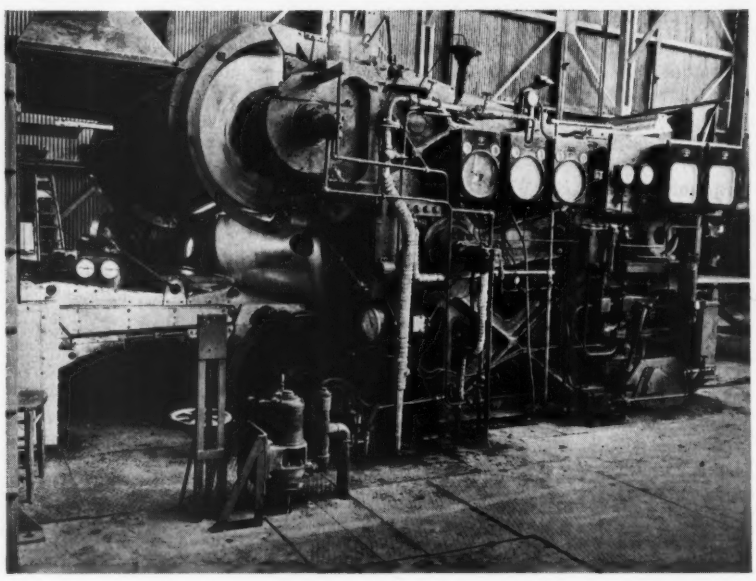
The above results were obtained on a Dunlop Friction Tester.

P.V.C.

Here experience has shown several points to be in need of study. Static electrical charges built up by p.v.c. belting threatened at one point to cancel out the non-inflammable nature of the belting, the main reason for its original adoption. Dunlops have devised a test rig on which this and other factors, such as friction, can be studied. Research has shown that a resistivity of not greater than 3×10^8, or a charge of less than 3,000 volts, is within the limits of safe working. In practice, belts have been known to build up charges up to 12,000 volts, some 8,000 more than is necessary to ignite methane. Static build up is caused by the separation of charges which occur when the belt passes over a pulley.

Work has therefore been done on making the belts antistatic, i.e. capable of dissipating a charge by enclosing the belt in a cover containing carbon black, the black being the conductive medium. Other work has been done on a range of compounds containing the OH group, notably ethylene glycol. A further development has been the introduction by A. Boake Roberts and Co., Ltd., of an antistatic agent, Antistat A., which has given good results.

The complete solution to this problem is still to come, but work now in progress at the Dunlop research centre at Birmingham on antistatic agents indicates that certain chemical structures are more efficient than others. The problem is being studied from this standpoint therefore, with the aid of the infra red spectrometer, X-ray analysis, and the electron microscope. The results may well have repercussions outside the mine-belting field.



A view of a Rotocure machine, one of the machines employed at Speke in belting manufacture.

Friction

The three conditions governing the friction characteristics of a belt are

(1) Resilience of belt cover (i.e., rubberiness).
(2) Flexibility of belt and its ability to hug pulley.
(3) Co-efficient of friction.

Under actual mining conditions, all the three factors mentioned above come into play, and here Dunlop have been able to utilize their vast experience in tyre manufacture. An analogy with a tyre may be offered, in that the roadway has the same function as the belt, and the tyre the same as the pulley.

DUCK STRENGTHS

Fabrics commonly encountered in the manufacture of Dunlop p.v.c. conveyor belting show the following characteristics.

Usual Construction	Weight (ozs./sq. yd.)	Strength (lbs./1" width)		Materials	
		Warp	Weft	Warp	Weft
4, 5 and 6 Ply	27·5	370	210	Cotton	Cotton
2–3 Ply ...	48 (Type 1)	1,000	200	"	"
2–3 Ply ...	48 (Type 2)	1,000	250	Rayon	"
Single Ply ...	116	2,500	580	"	Rayon

Slippage of the p.v.c. belting has been sufficiently serious to warrant full-scale investigation at Speke, and modification of the compound used to surface the duck appears to offer advantages. The possibility of embossing a tread on the surface of the belt is also under consideration.

Production

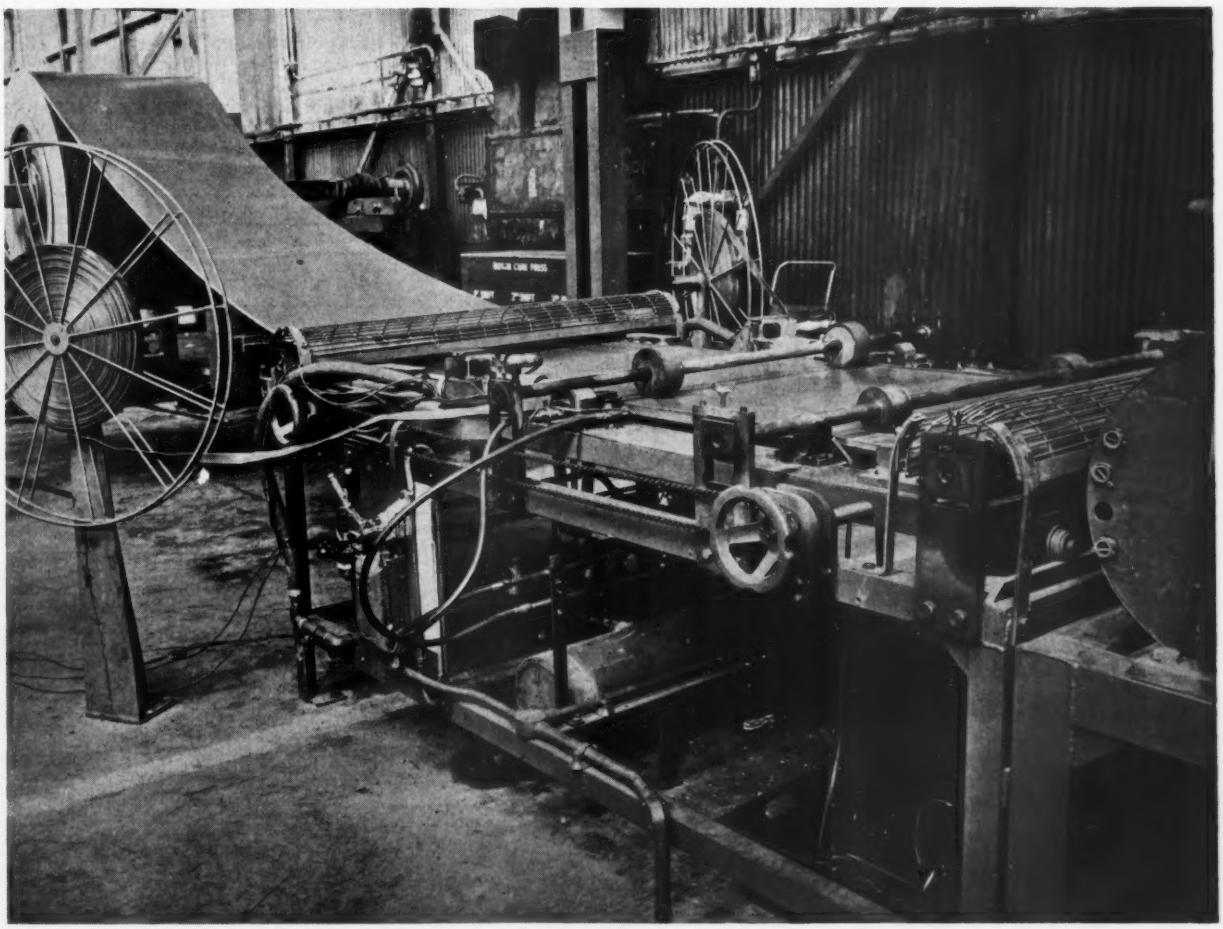
Coupled with research into belting performance is the steady improvement of the production facilities at Speke. An extensive drying and pre-heating system has been in use for sometime, constructed to Dunlop specification by the Spooner Dryer Co., Ltd., of Ilkley, Yorkshire. The Spooner drying system was discussed in the December issue of *Plastics* for 1955.

P.v.c. polymer and plasticizers are separately metered by modified petrol-type pumps to mixing units, so that a high level of accuracy can be maintained.

Belt production is either by Francis Shaw presses, producing about 30 ft. per hour, or Rotocures, running 3½ ft. per minute. In either case the belting is edged by a p.v.c. extrusion which is heat sealed to the belt edge. This technique for sealing was devised and developed at Speke.

Conclusion

A few years ago, p.v.c. belting was unknown. Today, a tremendous quantity is in use underground. This scale of development has been possible only by the decisive progress of the small group of manufacturers concerned. It is therefore specially gratifying to note that notwithstanding this short development period, fundamental research has already progressed so far.



Detailed view of the belt-edging equipment. The process comprises the continuous fusion of a p.v.c. extrusion to the edges of the belt. The exposed duck is thus sealed off.

P.V.C. Pastes—Theory and Practice

Part 3. Closed-Cell Foaming, Dipping, Slush Moulding

By M. S. WELLING*

This is the concluding part of this article which has dealt with paste formulation and the different processes which use these formulations.

The Chemical Blowing Method

THIS process employs chemical blowing agents such as BL-353 (70% N,N'-dimethyl-N,N'-dinitroso terephthalamide and 30% mineral oil) and the Genitrons, which will be discussed later. By means of this type of agent and the controlled application of heat, foams may be prepared over a wide range of densities and other physical properties. Decomposition of BL-353 in a p.v.c. paste starts at about 60° C. and is completed at about 100° C. The effect of BL-353 concentration on foam density is shown in the accompanying graph (Fig. 6).

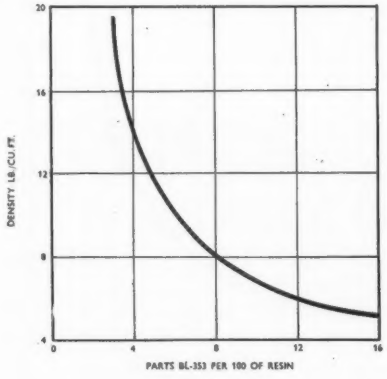


Fig. 6.

Plasticizer systems which can be used in this particular foaming process may be completely polymeric, completely monomeric or a combination of the two. Polymeric plasticizers may be of the epoxy polyester type or other polymeric polyesters. Their use is said to produce foams with minimum odour and fine cell structure.

Monomeric plasticizers are cheaper and produce pastes having a lower viscosity than those prepared from polymeric plasticizers. Minimum foam density produced with monomeric plasticizers is about 5 lb./cu. ft. and the resin/plasticizer ratio may be as low as 100/60.

The plasticizer system must be such as to allow the blowing agent to fully decompose before the gelation point of the paste is reached. For this reason high-solvating types of plasticizers such as tritolyl phosphate and dioctyl phthalate can only be used in conjunction with one of the less active plasticizers. Experiments have shown that the gelation point of p.v.c. pastes may be further modified by the incorporation of certain plasticizer-soluble metal salts of alkyl aryl petroleum sulphonates, e.g. neutral calcium petronate and barium petroleum sulphonate, used at concentrations of 3–4 parts per 100 of resin. They are particularly effective with monomeric plasticizers.

* British Geon Ltd.

The thorough mixing of the foaming agent into the paste is very important; insufficient mixing may result in inefficient expansion, formation of cavities, and irregular and/or coarse cell structure, all resulting in a variation of the physical properties of the finished product. It is also essential to keep the mixing temperature at 48° C. or lower to prevent loss of gas and thus reduction in expansion efficiency. Plasticizers also tend to activate the compound, resulting in the liberation of a slight amount of gas at room temperature.

Conversion of the expandable paste into foam takes place in two stages. During the first stage heat is applied at a rate which completely liberates the nitrogen from the foaming agent, whilst during the second stage the unstable foam is heated further to effect complete fusion. There are two methods of accomplishing this conversion.

In the " single-temperature method " expansion of the paste and fusion of the resultant foam occur at one temperature level. This method is useful when only single-zone hot-air ovens are available. Efficient foam formation by the single-temperature method is governed by factors such as blowing agent concentration, mould design and gelling temperature of the particular formulation used. The temperature must be high enough to ensure complete fusion of the foam within a reasonable time, but the rate of heating must be such that the blowing agent is completely decomposed before fusion occurs, for obvious reasons.

The length of the heating cycle is governed also by the amount of foaming agent used. Examples cited by du Pont include pastes containing 3–5 parts BL-353 per 100 of resin which required 3–8 min. at 185°–210° C. for conversion into $\frac{3}{8}$ in. thick foam whilst pastes containing 5–10 parts BL-353 per 100 of resin required a lower temperature and a correspondingly longer cycle, e.g. 12 min. at 177° C.

The " two-temperature method " is preferable to the method first described since it is less critical to operate, danger of gelation prior to complete gas release being almost eliminated. Operating conditions are determined by the factors mentioned previously. A typical operating cycle consists of introducing the expandable p.v.c. paste containing 14 parts or more of BL-353 per 100 of resin, into a thin walled aluminium mould and heating to about 100° C. to initiate foaming, followed by further heating at 79° C. to complete gas release. In the case of unpigmented pastes, this point is indicated by a colour change from yellow to white.

The second stage consists of transferring the mould containing the foamed p.v.c. mass obtained as above, to an oven at 160°–165° C. for a further 30–40 minutes. Slightly higher temperatures are needed if the plasticizer content is low, e.g. 60 parts per 100 of resin.

As with the single-temperature method, expansion efficiency is related to the depth of paste in the mould, and it is possible to prepare foams 3–4 in. thick. By using dielectric heating, the heating cycle for the second step may be considerably reduced. This method of heating is essential for thicknesses of 3 in. or greater and, since it only fuses the interior of the foam, provision must be made to fuse the surface.

Preparation of Closed-Cell P.V.C.

Closed-cell p.v.c. is made by the incorporation of nitrogen releasing blowing agents such as azodicarbonamide (Genitron A.C., Celogen A.Z.) azo-diisobutyronitrile (Genitron A.Z.D.N., Porofor N) pp' oxy-bis (benzene sulphonhydrazide) (Genitron O.B., Celogen), dinitroiso-pentamethylene tetramine (Vulcacel BN, Unicel ND) and N,N'-dimethyl-N,N'-dinitroiso terephthalamide (BL-353).

Blowing agents should decompose at a specific temperature or over a very short temperature range so that a sudden blow is obtained, producing powerful expansion. They should be non-staining and odourless and the residue after decomposition should be colour- and odourless, non-staining and, if possible, non-toxic.

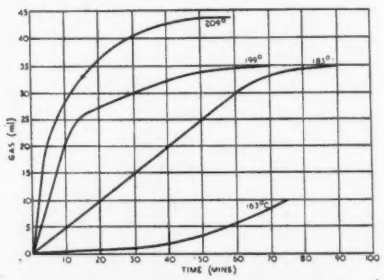


Fig. 7. Gas evolution curves for 0.1g. azodicarbonamide in tritolyl phosphate. (Courtesy Whiffen & Sons Ltd.)

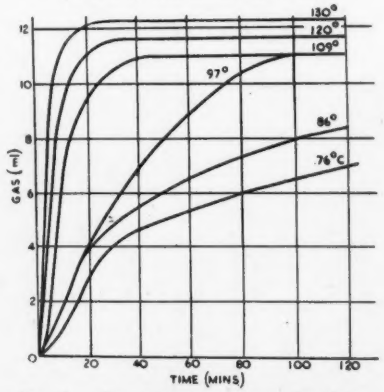


Fig. 8. Gas evolution curves for 0.1g. azo-diisobutyronitrile in tritolyl phosphate. (Courtesy Whiffen & Sons Ltd.)

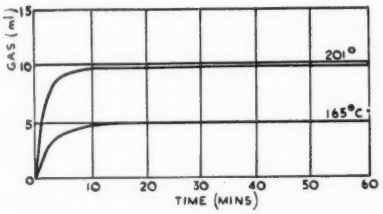


Fig. 9. Gas evolution curves for 0.1g. pp' oxy-bis in tritolyl phosphate (Courtesy Whiffen & Sons Ltd.)

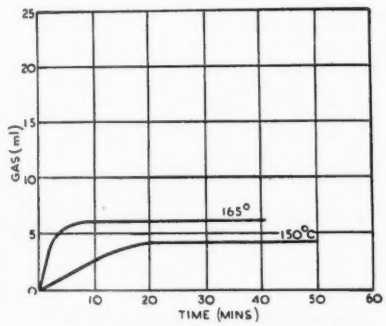


Fig. 10. Gas evolution curves for 0.1g. pp' oxy-bis in dioctyl phthalate. (Courtesy Whiffen & Sons Ltd.)

Figures 7–12 show the gas evolution of the commonly used blowing agents. These figures refer to 0.1 gr. of blowing agent. Figs. 9 and 10 show that pp' oxy-bis (benzene sulphonhydrazide) is inhibited by both tritolyl phosphate and dioctyl phthalate.

Trade Name	Gas Evolution		
	ml/g[1])	at ^{0} C[2])	In min.
Genitron A.C. ...	300	199	30
Genitron A.Z.D.N.	123	130	20
Genitron O.B. ...	100	200	10
Vulcacel BN ...	162	150	30
BL-353	170	140	25

(1) The figures given assume complete decomposition. In practice up to about 95% of the available nitrogen is usually liberated. Most of the gas is produced during the first 3–4 minutes, though it takes up to 30 minutes

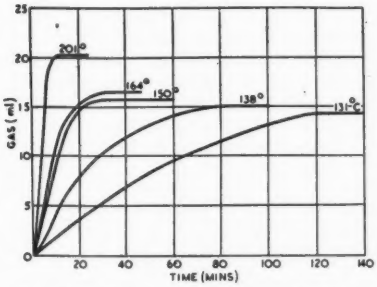


Fig. 11. Gas evolution curves for 0.1g. dinitroso-pentamethylene tetramine in tritolyl phosphate. (Courtesy Whiffen & Sons Ltd.)

to completely decompose the blowing agent. The rate of decomposition increases as the temperature rises.

(2) These temperatures are approximate, since decomposition usually takes place over a temperature range. Figures given apply to a solution of the compound in tritolyl phosphate.

Genitron A.C. is one of the most powerful blowing agents available. Its blowing temperature can, if necessary, be lowered to about 190° C.

Genitron A.Z.D.N., also a powerful blowing agent, was first produced in Germany (Porofor N.). Its disadvantage is that both the material itself and its residue are toxic.

Genitron O.B. is said to be the nearest approach to a " universal " blowing agent in that it fulfils most of the ideal conditions for this type of compound.

The general procedure adopted for blowing p.v.c. using the above compounds is quite simple, and can be accomplished by two methods:—

(*a*) Using a normal sized mould and expanding after fusion.

(*b*) Using an oversized mould and allowing expansion to occur during the fusion process.

A typical method for preparing p.v.c. sponge by the first method, using Genitron O.B., is given below.

A paste consisting of dioctyl phthalate and Genitron O.B. in the ratio 53 : 47 is passed several times through a triple roll mill, using a fairly close nip. Twenty-seven parts of this mix

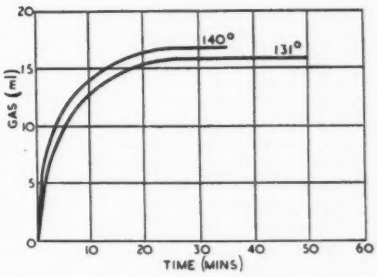


Fig. 12. Gas evolution curves for 0.1g. NN'-dimethyl-NN'-dinitroso-terephthalamide in tritolyl phosphate. (Courtesy Whiffen & Sons Ltd.)

are then blended with the p.v.c. paste having the following composition:—

Geon 121	47.5
Dioctyl phthalate ..	52.5
Calcium Stearate ..	3

The mould is filled with the resulting mixture and heated at 125°–130° C. and 3–7 tons/sq. in. for 30 minutes. The temperature is then slowly increased to 160° C. during 7 minutes and maintained for a further 8 minutes.

After cooling to room temperature and releasing the pressure, final expansion is achieved by immersing in water at 75°–80° C. for about 30 minutes. The product is then removed and finally heated in an air-oven for 30 minutes at 60° C. This will result in a product having a density of approximately 10 lb./cu. ft. (S.G. 0.15).

The second method is a slight variation of the one just described. In this method, full expansion takes place during fusion making it unnecessary to reheat the moulding on removal from the mould. Particular care is required in both methods, in determining both the amount of blowing agent incorporated in the mix as well as the quantity of p.v.c. paste added to the mould. Too much blowing agent may result in instability and breakdown of the cells, whilst too much paste in the mould results in the formation of a thick outer skin.

(Right) P.V.C. dipped wire baskets entering the fusing oven. (Courtesy British Geon Ltd. and Savage & Parsons Ltd.)

(Below) Dipped gloves draining before fusing. (Courtesy James North & Sons Ltd.)

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Dipping of P.V.C. Pastes

Pastes can be processed by the dipping technique to form either permanent or strippable coatings with very little difficulty, and as in the case of spreading, the technique depends primarily on the flow characteristics of the paste used. Pastes having nearly Newtonian flow properties will form relatively thin films, whereas those exhibiting thixotropy will form much thicker deposits.

Coatings can be obtained by either the " cold dipping " or the " hot dipping " technique.

Cold Dipping Technique

This technique is of particular importance when a coating of even thickness is to be applied to an object which is irregular in thickness. The " hot dipping " method would not be suitable since the variation in thickness would result in the thicker parts having a great heat capacity, thus leading to an uneven coating of paste.

Pastes suitable for cold dipping should have low viscosity and freedom from dilatancy (see Part I). As only thin deposits are produced, it is usual to repeat the process a number of times to build up the required thickness.

Generally speaking, the thickness of the coating is controlled by the viscosity and flow properties of the paste and the speed of withdrawal of the former. The paste should be deaerated and formation of bubbles during the dipping process should be avoided; this may be done by immersing the former very slowly.

Draining of the former should be carried out over a special draining tank whose contents can be deaerated before being returned to the main reservoir. The speed of withdrawal of the former should be regulated according to the viscosity of the paste; too fast a withdrawal may result in flow marks. When an article does not lend itself easily to draining, e.g. a dish rack, it is necessary to rotate the article after dipping in order to distribute the paste evenly.

A typical formula for cold dipping paste consists of the following:—

Geon 121..	50
Dioctyl phthalate ..	40
Dioctyle sebacate ..	10
White lead paste* ..	1

* Composition of this paste is white lead 70%
DOP 30%

In order to shorten the dipping cycle when a fairly thick coating is required, the inclusion of a thickening agent is often useful. Pastes thickened by such agents are highly thixotropic, leading to " setting-up " of the coating when the former is withdrawn. This phenomenon is put to good use when dipping objects which, by virtue of their design, cannot be drained of excess paste by conventional methods. By careful control of speed of withdrawal a completely homogeneous non-dripping coating can be obtained. The withdrawal speed is determined by the yield value of the paste so that when the former leaves the paste surface the drag on the coating is insufficient to cause it to flow and consequently drip.

A typical non-dripping paste employing thickening agents is given below:—

Geon 121..	50
Dioctyl phthalate ..	40
Dioctyl sebacate	10
High oil absorption filler	10
Aluminium stearate ..	0.7
White lead paste* ..	1.0

* Composition of this paste is white lead 70%
DOP 30%

Hot Dipping Technique

Hot dipping entails pre-heating the former prior to immersion in the paste reservoir. By such a method, thick coatings can be obtained with a single dip. The former is usually heated to the temperature of about 100°–130° C.

The thickness of the deposit depends on five factors: (*a*) temperature of the former, (*b*) heat capacity of the former, (*c*) time of immersion, (*d*) viscosity of paste, and (*e*) shape of former.

In general, thicknesses of the order of $\frac{1}{8}$ in. can be built up in about one to two minutes. The exact temperature, time of immersion, etc., depend upon the article being coated, the thickness of coating and the hardness of the finished product.

Although this method has much to commend it, it has one serious disadvantage in that in long runs the stability of the paste is affected. This is due to the continual immersion of hot formers which not only gradually increase the temperature of the reservoir, but also cause local spots of semi-gelled paste. This results in an increase of viscosity and the formation of lumps. These effects can be minimized by efficient temperature control and slow stirring of the paste.

Slush Moulding of P.V.C. Pastes

The slush-moulding process, reduced to the simplest terms, involves filling the mould with p.v.c. paste, inverting it, and draining off excess paste, leaving a fairly thin coating on the mould walls, fusing the coating and removing the finished article.

There are two basic methods used for slush-moulding p.v.c. pastes, namely the " one-pour " and " two-pour " methods. Each can be varied depending on the equipment available. The first step is common to both methods: the mould is filled with paste. This is an important operation and must be performed with care as it is at this stage that many rejects originate. The paste must completely wet the surface of the mould and if there are undercuts air must not be allowed to remain trapped. Proper formulation of the paste will minimize the risk of failure, and in addition, entrapped air can be removed by placing the mould under vacuum or by vibration.

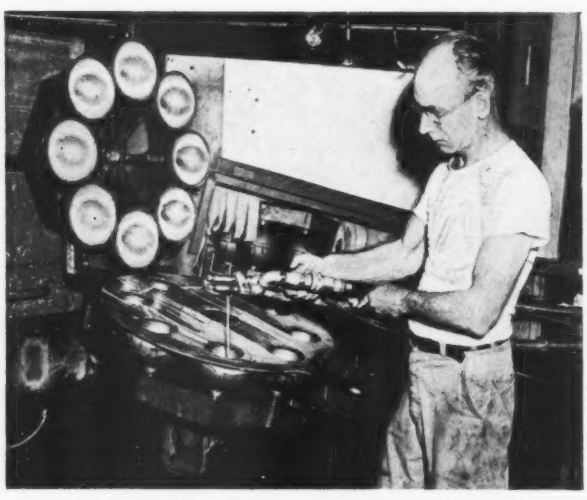
The " One-pour " Method

The paste-filled mould is heated by infra-red lamps. This gels the layer of paste nearest to the wall. The thickness of the gelled p.v.c. layer will depend on time and temperature as well as the formulation. As soon as the desired thickness of gel has been built up the mould is inverted, the paste decanted and the mould allowed to drain.

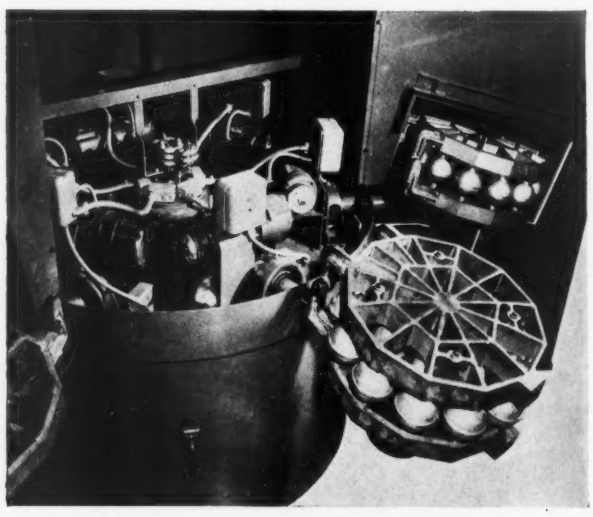
The mould is then carried on a conveyor into a fusion oven kept at a temperature of about 315° C. in order to speed up production. After fusion and passage through a cooling chamber, the mould is sufficiently cool (i.e. lower than 88° C.) to permit removal of the finished article without risk of tearing or permanent distortion.

The " Two-pour " Method

In this method, the mould is filled with p.v.c. paste and then inverted to allow the paste to drain out. The mould is then—still in this inverted position—placed on a conveyor. The paste continues draining into a trough beneath the conveyor. Since the mould is not heated at



Filling the moulds for slush moulding p.v.c. balls. (Courtesy National Latex Products Co.)



Rotating mechanism of the automatic slush moulding machine. (Courtesy The Akron Presform Mold Co.)

this stage, there remains only a very thin unfused film of paste lining the mould. After a definite time the mould reaches the first fusion oven, kept at a temperature of 180°–315° C. Travel through this oven is quite rapid and the paste film is only partly fused.

The hot mould is removed from the conveyor as it comes out of the oven, filled with paste, deaerated, and again inverted on a conveyor, the paste draining into a second trough.

In the second filling of the hot mould the layer of paste adjacent to the mould wall gels, and when it is inverted, a fairly thick layer of gelled p.v.c. remains behind, superimposed on the partly fused film obtained previously.

The thickness of the second coat depends on four factors: temperature of mould, thickness of mould, i.e. the ability of the mould to give up its heat to the cold paste poured into it, gelling characteristics of the paste, and finally the time the paste is allowed to remain in the hot mould before it is inverted and drained. It also depends on the temperature of the first oven: if it is high, the mould will be very hot on coming out, resulting in the gelling of more paste than would be the case if the temperature were lower.

After all ungelled paste has drained off, the mould and contents are carried into the final fusion oven which is usually at about the same temperature as the first oven. More time is allowed for the mould to remain in this oven, in order to completely fuse the paste layer.

When the mould comes out of the fusion oven it is partially cooled and the moulding removed. This can be easily accomplished by the use of a jet of compressed air which releases the moulding.

A typical set-up using the "two-pour" method will accommodate approximately 200 moulds with a total time cycle of about 15 minutes per mould. The 200 moulds thus go through the machine four times in an hour, producing 800 pieces.

In addition to ensuring that all occluded air is removed from the paste, contamination by pieces of dirt or partly gelled paste should also be prevented by covering the draining troughs with fine wire mesh.

The slush moulding methods described above employ moulds made in one piece, but the slush moulding technique can also be used with a split mould which is closed during the fusion cycle. This type of mould is often formed just like the regular slush moulds, but with two major differences. Two half-moulds are made by the conventional methods and are then fitted so that when clamped together they form a tight closed mould.

One method of operating the slush moulding technique using this type of mould is of pouring a weighed amount of p.v.c. paste into one half of the mould; the other half is then clamped on. The mould is then placed on a spindle rotating about two axes, preferably set at right angles to each other, and operating in a fusion oven. The paste will thus cover the entire inside of the mould. By carefully controlling the speed of rotation and temperature a reasonably uniform fused film is formed on the inside of the mould. After partially cooling the mould the clamps are removed and the slush-moulded article removed. This process is also referred to as " rotational casting."

A typical rotational moulding machine consists of six spindles revolving about a central shaft. Each spindle carries a multiple cavity mould, and has its own rotational movement which is independent of the central shaft movement. Uniform thickness of the final article is thereby assured.

The unit is enclosed in a circular oven and cooling unit occupying about two-thirds of the complete circle. The remaining one-third is open in order to allow the moulds to be stripped and refilled for the next cycle. Each cycle takes 12–20 minutes. With a machine carrying six spindles this means a multiple cavity mould is stripped every 2–3 minutes.

A variation of this method can be accomplished as follows. The mould is clamped together and a hole is drilled into it in a part of the mould suitable for filling, and drainage of the excess paste. When the paste has been introduced into the split mould and a satisfactory thickness of gelled p.v.c. has been secured, as in the "one-pour" method, the excess paste is drained out through the hole.

The hole is then closed by means of a tapped plug and hung on the conveyor with the plugged hole at the bottom position of the mould. Sufficient ungelled paste will drain over this plugged hole to close it. The finished article is then removed from the mould by releasing the clamp and splitting the mould.

LETTERS TO THE EDITOR

Correspondents are reminded that a stamped addressed envelope should be enclosed in all cases where a personal answer is desired. It is understood that any letter received may be published at the discretion of the Editor.

Glass Fibre/Polyester Resin

SIR,—May I congratulate you on your " Second thoughts on Glass Fibre/Polyester Products." I would like to have seen some points better driven home in the hope that your message will be taken to heart by the various manufacturers both within and outside the plastic industry who have been playing around with polyester/glass. Surely we do not want the plastic industry to get a bad name by supplying components which do not perform to maximum performance. (No doubt everyone remembers the p.v.c. trouble in 1945/47.)

Unfortunately, as you state, the raw material suppliers as well as the press must take the major share of the responsibility for the present state of affairs.

Fortunately a few of the players are finding out that the game is not an easy way to riches. No doubt in the next eight years those seriously interested will, with the exception of prototypes and a few off, be using at least pressure bag presses giving a minimum of 30 lbs. per sq. inch.

But here we come to a point when we have to ask ourselves two questions.

(1) Has the interest in Polyester for laminating been aroused because of the fact that many thought no pressure would give a good job (which of course means little capital investment).

(2) Now that it has been found that pressures are essential to obtain maximum performance of the laminate (which means capital investment considerably higher than 1). To what extent will manufacturers be considering such resins as phenolic low pressure which is cheaper and has some other advantages over polyester.

In concluding may I say that I personally envisage that pre-mix moulding will make the greatest strides in the next eight years.

A. LESSHERM.

Stella House,
Stallington Road,
Blythe Bridge,
Stoke-on-Trent.

Upholstery Fabrics

SIR,—I am looking for " Leathercloth," and Saran fabrics for upholstery in passenger cars.

Would you be in a position to let me have some addresses of manufacturers of these goods in Gt. Britain? Or, better still, could you ask any firm who has these goods in his production line to send me samples and prices?

HENRI LOMBARD.

Papeete,
Tahiti.

P.V.C. Tubing

SIR,—We shall be grateful if you could let us have the names of manufacturers of p.v.c. tubing suitable for pulling over $\frac{5}{8}$ in. diameter conduit.

KNIGHTSHADES LTD.

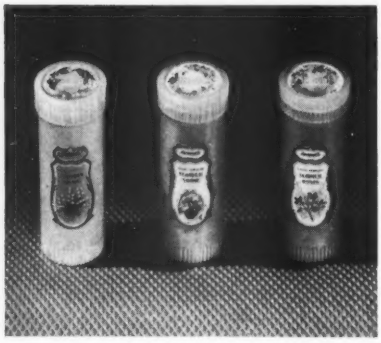
Silverhill Works,
Theaklen Drive,
St. Leonards-on-Sea,
Sussex.

New Productions

Perfume Containers

Illustrated is the new dainty solid perfume container at present being made for Messrs. R. Demuth & Co., Ltd., by Universal Metal Products Ltd., Langley Road, Salford 6, Lancs. The body is injection moulded from polystyrene, pink for "Summer Roses" perfume, green for "Flower Show" perfume, and white for "Muguet de Mai" perfume.

The cap is also injection moulded, this time from polythene which, being flexible, gives



Injection moulded perfume containers

a much more airtight closure than would a rigid plastic, an advantage so necessary to this type of product which has an alcohol base and is, therefore, subject to evaporation. The novel top to the cap is achieved by a paper label being placed in a recess in the top of the cap, and a transparent polystyrene disc embossed "Demuth" sprung into the recess over the label. Both types of plastic which compose this container are odourless and resistant to chemicals, and thus cause no "off-notes" in the perfume.

Advertising Display

Specially made for counter window displays this 2 ft. 6 in. Coca Cola bottle is vacuum formed in two parts from 60/1000 Cellastine, made by British Celanese Ltd. The vacuum forming is done by Delta Plastics, Worcester Place, Oxford. The two halves are cemented together and sprayed with a tinted cellulose lacquer to simulate the contents of the bottle. A separately formed silver crown cork, silk screened with the trade mark is fitted to the top of the bottle and the whole is mounted on a vacuum formed black base which houses a 40 watt bulb for illumination.

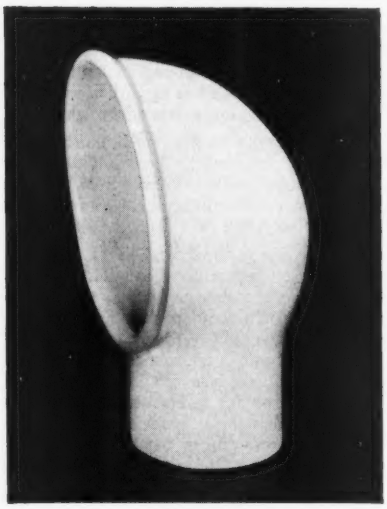
(Left) Vacuum formed advertising display unit.

Ventilator Cowl

A recent addition to ship fittings for smaller craft is a ventilator cowl, a photograph of which appears on this page. The cowl has been specially designed by Mr. A. C. Robb for manufacture in Beetle polyester resin and glass fibre. The cowl is made on a male form constructed in two pieces so that the stem can be removed from the moulding separately. The bead round the mouth of the cowl is formed during moulding and a brass bush is also bonded in at the base of the stem. The cowl is painted after moulding and measures 4 in. in diameter, the height being variable to suit the customers' requirements. The moulding is done by Fibromold Ltd., Hanworth Lane, Chertsey, Surrey.

Hammer and Truncheon

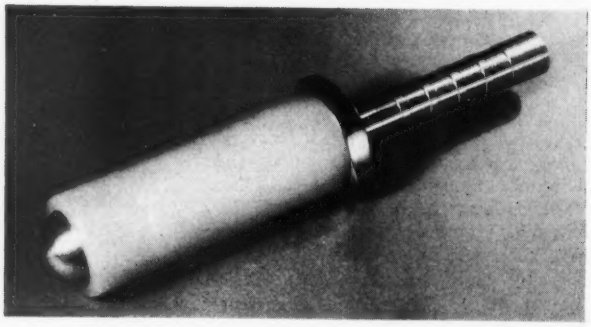
We illustrate two new products of the Thor Hammer Company, Salop St., Birmingham 12. The first, known as the Thorex Featherweight Hammer has a fabric laminate head into which the two polythene faces are screwed. Alternative faces of different materials and of different styles will soon be available to extend the versatility of this hammer.



Ventilator cowl moulded in glass fibre reinforced polyester resin

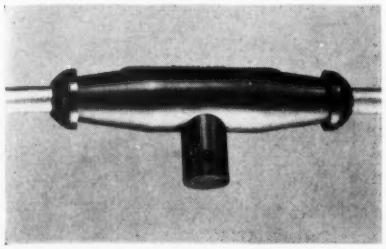
The Thor Plastic Truncheon has been specially made for use as a butchers mallet and comprises a 2 in. diameter polythene sleeve mounted on a duralumin handle and secured by an oval nut. The sleeve can be readily removed for cleaning and its durability is reported as being far greater than the conventional wooden mallet.

This truncheon is also used by fireworks manufacturers because of its non-sparking properties and endurance.

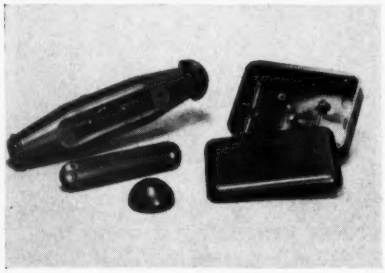


(Right) The Thor butchers mallet with a polythene head.

(Right) The Thor hammer with detachable polythene faces.



(Left) Dipole insulator moulded in polystyrene with polythene bushes.



(Left) The parts of the insulator and also the terminal box.

(Right) the Bray Dualoader with glass fibre reinforced polyester cab and engine cowling.

Polystyrene for T.V. Aerials

Terminal boxes and dipole insulators for television aerials produced by Labgear (Cambridge) Ltd., are injection moulded in high-impact polystyrene.

Moulded for Labgear by the Plastics Division of the Mentmore Manufacturing Co., Ltd., the insulator has a screw-down panel for easy access to connections. Both the panel and the detachable polythene bushes are tight-locking to prevent moisture infiltration. Holes in the base allow the aerial lead to be fixed by a self-tapping screw.

The terminal box is moulded with a snap-fitting lid and depressed cavities in the base. These can be easily cut to allow for variations in fitting.

Tractor Cab

The new Bray Dualoader which we illustrate here is fitted with glass reinforced polyester resin cab and engine cowling. The doors to the cab are of steel plate. The moulding of these components is carried out by Wemyss Woodhouse Ltd., Talbot Road, Rickmansworth, Herts, for W. E. Bray & Co., Ltd., Faggs Road, Feltham, Middlesex. The resin used is supplied by W. A. Mitchell and Smith Ltd., Church Road, Mitcham, Surrey.

Mobile Bottle

Used for transporting advertisement material and in itself probably one of the most eye-catching advertisements seen, is the "Mobile Bottle," which has been constructed to advertise Bass and Worthington.

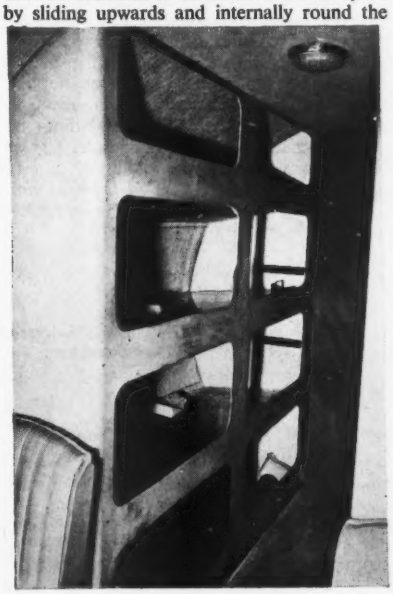
The vehicle consists of a glass fibre reinforced polyester bottle 33 times actual size and forming cab and body mounted on a Seddon mark 7P bus chassis. The entire construction including the moulding of the bottle was undertaken by Seddon Diesel Vehicles Ltd. to an order placed through Ryland Garage Ltd.

The main body of the bottle is $\frac{1}{16}$ in. thick consisting of one layer of 1 oz. chopped strand glass fibre mat and two layers of 2 oz. chopped strand mat impregnated with 4116 Beetle Polyester resin.

The entire structure of the Bass bottle is self-supporting. There are no ribs of any kind and strength is provided solely by the skin and its cylindrical shape. The interior of the bottle is fitted with glass fibre shelves for carrying display and advertising material; these shelves are bonded to the main skin.

The basic bottle was moulded in halves and joined along the top and bottom. The joints were made by flanging the edges of each half and bonding glass cloth over the joint.

The base of the bottle is made of glass fibre and safety glass, the latter forming a flat windscreen for the two occupants. There is a door on each side of the cabin and each opens by sliding upwards and internally round the circumference of the bottle. The doors comprise wooden frames to which are bonded glass fibre panels on each side.

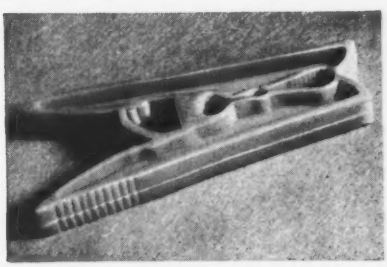


All resin/glass parts of the Bass mobile bottle were made from moulds of 14-gauge aluminium sheet formed by normal panel-beating methods. The moulds were first polished with a hard wax and then sprayed with a polyvinyl alcohol solution in spirit.

Materials used in the structure were: 2 cwt. of chopped strand mat; 5 cwt. of polyester resin; 1 cwt. of microcalcite chalk filler and 20 lb. of black filler paste to give a good surface for the final finish of black cellulose.

Polythene Clothes Peg

Now in production at the factory of Barclay-Stuart (Plastics), Ltd., 25–27 Brunswick St., Luton, Beds., is the one-piece moulded polythene clothes peg which we illustrate here. Although plastic pegs have been on the market for some years this is the first one-piece moulding.



(Above) Polythene clothes peg.
(Left) Inside the "Mobile Bottle."

Plastics NEWS

Plant and Equipment, Materials, Processes, Company News, Technical Literature, Exhibitions, Personal Notes, and Meetings.

NEW BRITISH STANDARDS. — The following standards have been issued and can be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1.

Vulcanized butadiene/acrylonitrile rubber compounds (B.S. 2751: 1956). **Vulcanized chloroprene rubber compounds** (B.S. 2752: 1956). B.S. 2751 and B.S. 2752 continue the series started with the issue of B.S. 1154 Vulcanized rubber compounds and B.S. 1155 Vulcanized extruded rubber compounds and tubing, specifically intended for Government Department use.

Each standard covers five synthetic rubber compounds ranging from 41° to 88° B.S. hardness and gives details of compositions which, however, allow some latitude to the manufacturer in formulating his mixes, together with details of skeleton mixes which have been found to meet the requirements of the standard.

Additionally, the two new standards specify requirements for physical properties, together with the necessary methods of test.

British Standard Classification of Insulating Materials for Electrical Machinery and Apparatus on the Basis of Thermal Stability in Service (B.S. 2757: 1956). The Classification now published as B.S. 2757 is, for all practical purposes, identical with the draft I.E.C. document prepared at Philadelphia in 1954, which represents the consensus of international opinion on the subject. Three new Classes E, F and H, are introduced and the former Class O has been re-designated Class Y. The basis of the new classification is not the chemical composition of materials but rather their ability to withstand the temperatures assigned to their class. These temperatures are stated and a general description of each class is given. There is an appendix which gives guidance on the classification of a number of particular insulating materials.

British Standard Methods of Testing Vulcanized Rubber (B.S. 903. Part C3: 1956). Following the recent issue of a number of revised parts of B.S. 903 Methods of testing vulcanized rubber, the British Standards Institution has now published Part C3, "Permittivity and power factor of insulating soft vulcanized rubber and ebonite," which is the first revised part which relates to electrical tests.

The document does not differ greatly from the 1950 version except in the layout and in the adoption of metric dimensions.

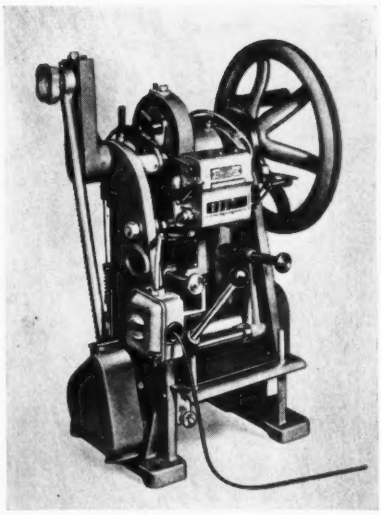
LONG FEED GUILLOTINE.—The newly developed guillotine, which has been designed to cut to length pieces of any dimension between zero and 6,000 ft., will provide a valuable addition to the range of guillotines manufactured by Wallis Engineering Co. Although these machines are designed for cutting most non-metallic materials up to $\frac{3}{16}$ in. thick, they will cut metal up to .018 in. thick. Method employed for measuring the length is by using a pair of feed rollers, which are crank operated and capable of adjustment between 0 and 8 in. The counter is set to operate the clutch solenoid after any pre-determined number of strokes of the feed crank up to 10,000. The counter is automatically re-set after each cut. By closing a switch on the side of the machine the extra long feed mechanism can be cut out and pieces of any length, up to 8 in. can be cut at the rate of 120 per minute.

Machines are made in three sizes, 5 in., 12 in. and 15 in. wide and like all the mechanically operated models of shorter length capacity, can be driven at 120 r.p.m., equivalent to a material feed speed of 80 ft. per minute when feeding the maximum of 8 in. per revolution of the feed crank.

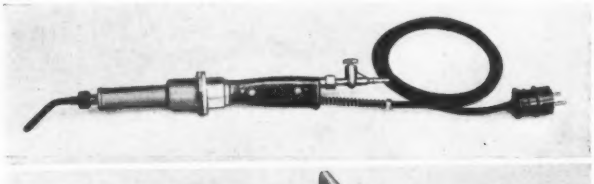
Larger shears to cut respectively 40 in. and 80 in. wide materials are also available.

WELDING GUN.—A new welding gun designed for use with any thermoplastic sheet material has recently been introduced by Horwitch Smith & Co. Ltd., Pensnett, Staffs, who are the agents for the manufacturers Knapsack-Griesheim A/G., Frankfurt (Main), W. Germany.

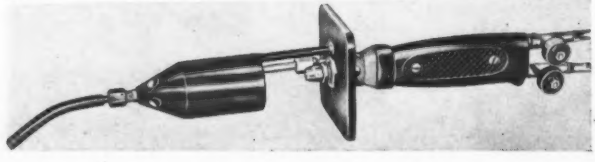
This gun, known as the T.P. Griesheim Welding Gun, can be operated by gas or electricity. In the former case the air stream which serves as the welding gas passes through a gas heated coil which brings it up to the required welding temperature. In the electrical gun this coil is replaced by a spiral heating element. A considerable variety of welding nozzles are available and also various types of elements to suit the power supply. The gas welding gun can be operated on various industrial gases besides normal town gas. Although a very complete instruction manual is supplied with each gun, preliminary training in operating techniques in order to ensure the best results, is advised. Horwitch Smith & Co. Ltd. will undertake this training of personnel.



The long feed guillotine.



The Griesheim electric welding gun.



The Griesheim gas welding gun.

General

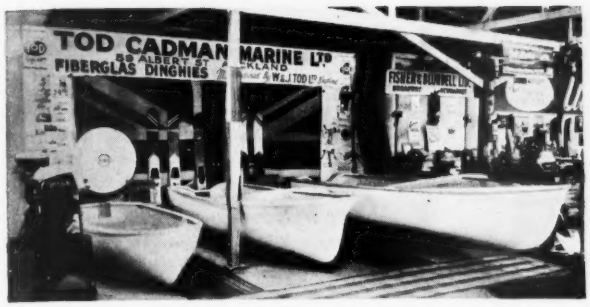
New Mould Material.—Specially developed for use in the making of injection moulds for the rubber and plastics industry, a new material, Devcon C is being marketed in the U.K. by E. P. Barrus (Concessionaires), Ltd., 12–16 Brunel Road, Acton, London, W.3. A mould from this material is made by pouring around a wood or plastic model. On hardening, the material can be drilled, tapped and machined with normal metal working tools. The properties reported indicate a compression strength of over 5,000 p.s.i. at 400° F. and practically no shrinkage on hardening. Heat transference is not as good as steel.

British Plastics Federation.—Steps are being taken to make better known overseas the unique service offered by the British Plastics Federation in publishing each month abstracts from technical articles in journals throughout the world dealing wholly or partly with plastics developments. The service includes the publishing of patents from the countries which have an important plastics industry.

National College of Rubber Technology Internal Diploma Examinations, 1956.—At their meeting on July 5, 1956, the Governors confirmed the following awards as the result of recent internal examinations:—

Associateship (*A.N.C.R.T.*).—Examinations taken by 17 candidates, all full-time students. Pass: S. N. Angove, D. C. Cording, F. Duerden, B.Sc., W. A. Hewett, J. Hood, P. R. Hull, B. D. Jones, M. J. Kitchiner, A. D. Mann, C. J. Mumford, T. T. Truscott, R. Hoole, B.Sc. (Referred in French translation). 11 pass = 65%.

Licentiateship (*L.N.C.R.T.*).—Examination taken by 13 candidates, mainly full-time students (PT = part-time). In future only full-time students of the College will be eligible for this Diploma. Pass: R. Czerniawski, T. G.



The stand of the New Zealand Associates of W. & J. Tod, Ltd.

The plastics house at the Paris International Building and Public Works Exhibition.

Freud, J. H. McKee, B. D. Parsons (PT), G. W. Schofield (PT), E. R. Sutton, B. J. Tiley, P. A. Wilkins (PT). 8 pass = 62%.

Company News

Grilon Nylon.—Holzverzuckerungs AG. the manufacturers of Grilon (nylon 6) have formed their own United Kingdom organization, **Grilon & Plastic Machinery, Ltd.,** 47 Victoria St., London, S.W.1. All future enquiries should be directed to this address.

Grilon & Plastic Machinery, Ltd., are also the agents for Machinery Factory & Foundry, Ltd., of Switzerland, the manufacturers of the Netstal plastics machinery.

Andrew Reid and Joan Cutting, the publicity officers of the British Plastics Federation have moved their offices to 17 Fleet Street, London, E.C.4. Tel. No. Fleet Street 8271–2.

T.I. Plastics, Ltd., announce that their Head Office is transferred to 39/41 Margravine Road, London, W.6, and all correspondence, other than that relating to accounts, should be directed there.

The accounts department of the company will be temporarily located at 58/72 John Bright Street, Birmingham, 1, to which address all remittances and communications in connection with accounts should be sent.

It is also announced that as from the 1st August, 1956, the business at present carried on by T.I. Plastics, Ltd., in polythene, p.v.c. and fittings, is to be transferred to Mange Plastics, Ltd. This latter company is also a member of the Tube Investments Group. It will operate from the above London and Birmingham addresses and will continue to supply tubing under the established mark "T.I. Polythene."

Winston Electronics, Ltd., Govett Avenue, Shepperton, Middlesex, have changed their telephone number from Walton-on-Thames 2732 to Walton-on-Thames 6321 (5 lines). Private Branch Exchange.

Aero Research, Ltd.—The telephone number of Aero Research, Ltd., Duxford, Cambridge, has been changed to Sawston 2121, and their Telex number is 10–101.

Preconomy, Ltd., tool, die and mould makers have moved to larger premises at Eastfield Side, Sutton-in-Ashfield, Notts.

Exhibitions

Factory Equipment Exhibition.—The theme of the fifth Factory Equipment Exhibition to be held at Earls Court, London, from April 29 to May 4, 1957, will be "Greater efficiency in industry."

Exhibits will cover every type of modern factory equipment for works both large and small.

Details regarding space, etc., may be obtained from the Organizer, Factory Equipment Exhibitions Ltd., 4 Snow Hill, London, E.C.1.

Electrical Engineers Exhibition.—The 6th Electrical Engineers Exhibition will be held at Earls Court from April 9 to 13, 1957.

Chemical and Petroleum Engineering Exhibition.—Although originally planned to occupy the Grand Hall, ground floor gallery of Olympia, The Chemical Plant Manufacturers Association and the Council of British Manufacturers of Petroleum Equipment have now taken the National Hall, ground floor gallery as well. The exhibition will be held from June 8 to 18, 1958, and all enquiries regarding space should be addressed to F. W. Bridges & Sons Ltd., 641 Grand Buildings, Trafalgar Square, London, W.C.2.

The 9th Technical Exhibition.—The Oil and Colour Chemists' Association announce that the 9th Technical Exhibition will be held in the New Hall of the Royal Horticultural Society, at Greycoat and Elverton Streets, London, S.W.1. The exhibition will take place on March 12 to 14, 1957. The closing date for receipt of applications for stand space will be Friday, September 7, 1956. Further information can be obtained from the Association at Memorial Hall, Farringdon Street, London, E.C.4.

Leipzig Trade Fair.—Special currency arrangements recently announced in Berlin enable visitors from Gt. Britain to the Fair, which runs from September 2 to September 9, to get 12.40 East German marks to the pound instead of 6.20. The concession will be available from August 10 to September 21.

British Food Fair.—The British Food Fair will be held at Olympia from August 28 to September 15, 1956.

Conferences

Rheological Techniques.—A course of about 10 lectures, suitable for Physicists and Chemists, will be given on Wednesdays, 6.30 to 8.30 p.m., commencing on October 10, 1956, at Battersea Polytechnic. The emphasis throughout the course will be on experimental methods leading to absolute measurements of stress and strain. Examples of instruments and results will be drawn from a wide range of industries.

T. H. & J. Daniels, Ltd., of Stroud, Gloucestershire, manufacturers of plastics moulding equipment, were represented at the Open Day of the North Gloucestershire Industrial Education Council held in Cheltenham on Saturday, July 14. The emphasis of the Open Day was on Careers in Industry and the educational requirements of candidates and the assistance required from the schools, particularly Grammar and Public Schools.

Fibreglass Conference.—Representatives of 20 nations took part in a conference of the Glass Fibre Industry at Oxford recently. Delegates also visited the works of Fibreglass, Ltd., at St. Helen's and many of the visitors proceeded up to Glasgow to visit Possil Works, which is the main centre for the production of continuous filament glass yarn.

Design Congress.—The Council of Industrial Design is organizing an international Design Congress as a sequel to the successful Congress on design policy in industry as a responsibility of high level management, held in 1951. The theme of the 1956 Congress will be: "The Management of Design." It aims to compare the experience of companies in Britain, the U.S.A., and Europe in the execution of their design policies.

The Congress will be held in the Victoria and Albert Museum and the Royal College of Art, South Kensington, on September 12 and 13. The CoID is inviting chief executives and designers from a limited number of firms, amounting to 200 in all.

Personal

Mr. Sydney Goode was presented with a caddy-car, a shooting stick and two polyester/glass fibre trays bearing the signatures of the Midland members at a meeting of the P.I.G.S. Midland Section, on July 17. Mr. Goode has been Hon. Secretary and Treasurer of this section since its inception and is retiring to Bournemouth in September.

Mr. R. Hawton-Hill, a foreman in one of the moulding shops of Litholite Insulators and St. Albans Mouldings, Ltd., recently completed 50 years' service with this company.

Mr. R. D. Williams has been appointed to the Board of Directors of Bernard Wardle (Everflex), Ltd. Mr. Williams joined the company in 1949 and shortly afterwards became Chief Chemist.

Mr. L. P. Hopwood.

Mr. R. S. Montgomerie, London manager of E.M.B. Co., Ltd., now resides at 10 Woodside Road Northwood, Middlesex. His telephone number, Northwood 2159, remains the same.

Mr. L. P. Hopwood has been appointed Scottish Area representative for E.M.B. Co., Ltd.

Mr. C. J. Osborne has joined Lacrinoid Products, Ltd., as Area Sales Manager (technical sales) for the Midlands and North of England.

Mr. Percival Huffman has resigned from the Board of Bakelite, Ltd., of which he was a joint vice-chairman in consequence of his retirement from active business. **Mr. W. B. Gallwey,** chairman of British Acheson Electrodes, Ltd., has been appointed a director to fill the vacancy.

Mr. G. H. Greenhalgh is to join D.S.I.R. in July as Scientific Attaché in Scandinavia. He is being loaned to D.S.I.R. by the Atomic Energy Authority's Research Establishment at Harwell and he will take up his duties in Stockholm in August after briefing in this country.

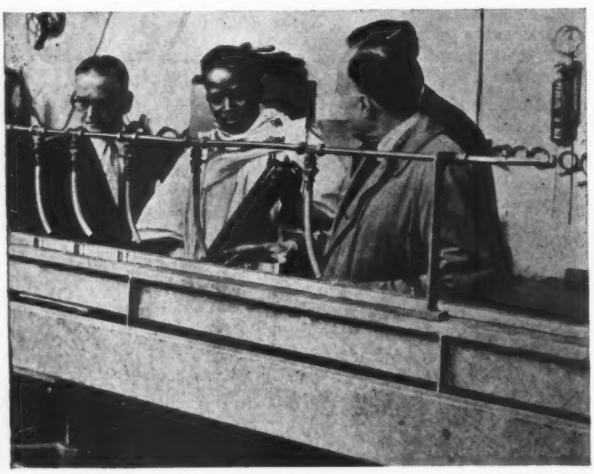
Mr. W. J. J. Webb.

Mr. W. J. J. Webb has been appointed Sales Manager of British Visqueen, Ltd. Mr. Webb, who was formerly employed in the London sales organization of I.C.I., has been responsible for the sale and development of polythene film since it was first marketed in this country by I.C.I. after the war.

Mr. J. L. Reynolds has been transferred from Kingsport to the Chicago office of Eastman Chemical Products, Inc., as sales representative for Tenite plastics. A new plastics division sales office is to be established in Kansas City, Missouri.

Mr. H. J. Taylor has been appointed manager of the Hadyn Park Works of Johnson, Matthey & Co., Ltd.

The Hon. Alhaji Aliyu and his permanent secretary recently visited the works of the Projectile & Engineering Co., Ltd., at Battersea, where they discussed with Mr. A. J. Chambers, the managing director, the production of polythene piping for irrigation and other purposes. The Hon. Alhaji Aliyu is the Chief Minister of Trade and Industry of Northern Nigeria.



The Chief Minister of Trade and Industry of Northern Nigeria at the works of the Projectile & Engineering Co., Ltd.

Dr. Walter Wilson has been appointed research manager to B.I.P. Chemicals Ltd., the principal subsidiary of the B.I.P. Group. Dr. Wilson is lecturer in organic chemistry at Birmingham University, and has made many contributions to the journals of the learned societies. He takes up his appointment on October 1.

Mr. John Beard, managing director of Streetly Manufacturing Co. Ltd., and director of B.I.P. Engineering Ltd., has been appointed deputy managing director of British Industrial Plastics Ltd.

Mr. Cyril Dingley.—At a recent board meeting of British Industries Plastics Ltd., Mr. Kenneth Chance, president of the company, made a presentation to Mr. Cyril Dingley to mark his 50 years of service to the company.

Golf.—The results of the Plastics Industry Golfing Society Tournament at Wentworth, on Thursday, June 28, were as follows: "British Plastics" Trophy Medal Competition: Winner, K. G. Butcher, 86 –11=75 net; Runner-up, W. A. Evans, 82 –6=76 net. Over 50's Competition Medal: Winner, T. S. Crabtree, 89 –13=76 net, after a tie with F. W. Walls and F. D. Fletcher. British Xylonite Trophy "Stableford Bogey Greensomes": Winners, J. G. Fisher and S. A. Goode, 40 points; Runners-up, J. W. Urban and R. McEwan, 37 points, after a tie with H. Brooks and L. Morton.

"Plastics in the Service of Man"

The following is a list of full names and addresses of companies mentioned in the illustrated feature, "Plastics in the Service of Man," which appears on pages 188 and 189 in this issue:—

67. Plastics in Caravans—2

Arnoplast Ltd., Kelhead Avenue, Glasgow, S.W.2.

Beetle—British Industrial Plastics Ltd., 1 Argyll Street, London, W.1.

Coventry Steel Caravans Ltd., Central Chambers, 148–150 The Parade, Royal Leamington Spa, Warwickshire.

Formica—Thos. De La Rue & Co., Ltd., Imperial House, 84/86 Regent Street, London, W.1.

Fraser & Glass Ltd., Woodside Lane, North Finchley, London, N.12.

Hardura—S. & J. Walsh (Plastics) Ltd., St. Lawrence Mill, Great Harwood, Blackburn, Lancs.

Lywood, O. G., Ltd., North Hyde Road, Hayes, Middlesex.

Mills, E. J., Compton Road, Colchester.

Peress, J. S., Ltd., Argosy Works, Kingston Road, Leatherhead, Surrey.

Perspex—Imperial Chemical Industries Ltd., Black Fan Road, Welwyn Garden City, Herts.

Racasan Ltd., 36 New Broad Street, London, E.C.2.

Streetly Mfg. Co., Ltd., Streetly Works, Sutton Coldfield.

Universal Metal Products Ltd., Langley Road, Pendleton, Salford 6, Lancs.

Velbex—B.X. Plastics Ltd., Higham Station Avenue, Chingford, London, E.4.

TALKING SHOP . . .

£1,000 in Bursaries at the Borough Polytechnic. September, it is hoped will see the start of the first four-year sandwich course in plastics technology. This scheme was prepared in the autumn of 1955 to implement the desire of the Government to increase the number of technologists in certain fields, and has been approved by the Regional Advisory Council.

Sandwich courses have been much discussed, particularly in connection with the Hives Committee which is responsible for the Diploma of Technology, a qualification to be comparable with a degree, but essentially technological in its bias. Students will alternate between six-month periods in industry and similar periods in technical colleges. On completion of this course at the Borough, the successful candidate should be able to secure the Associateship Diploma of the Plastics Institute and the Government Diploma of Technology, and will have behind him an intensive course of study both in classroom and factory.

This is but one, although perhaps the most important, of the courses in plastics now offered at the Borough, ranging from the full-time Diploma course to the special intensive short courses recently reported in *Plastics*. The Trustees of the Plastics Industry Education Fund have made available to the Polytechnic the sum of £1,000 to be distributed as bursaries. Interviews for prospective students will be held early in September. Applicants are advised to get into touch with the Head of the Chemistry Department, Borough Polytechnic, London, S.E.1, as soon as possible.

* * *

Prepacking in Foodstuffs. Housewives (and perhaps husbands) will have noted the growing trend towards prepacked foodstuffs, ranging from meat to vegetables. The other day in our local supermarket I was able to select two prime chops, both neatly berthed in a cardboard bowl and totally enclosed by a polythene film. I could examine each chop in detail before purchase, without harm or contamination to the meat. Airborne bacteria and flies were at last defeated.

In 1954 100,000 prepacks were marketed. The figures for June only of this year were 6 million, and by the autumn it is expected to be increased by several millions. Such a fantastic increase in this short period is explained by the willingness of the housewife to foot the additional bill—estimated at 2d.–3d. per lb. pack, for the sake of high quality graded produce, cleaned and ready for use, in an attractive pack with all the contents visible.

The development of prepacking is watched over by the Produce Prepacking Development Association, an active organization that should do much to sponsor increased public demand for foodstuffs packed in this way. Our industry will also study progress with interest; the volume of regenerated cellulose and polythene used for film manufacture can be expected to increase substantially in this application alone.

* * *

Institute News. Following the announcement by the London Section of officers for the year 1956–57, details are now to hand of other sections. In each case the chairman's name is given first, followed by the hon. secretary. Midlands—S. F. Sandford and M. A. Bardsley; North Western—K. H. Murray and C. Pollard; North Eastern—J. Jaggs and G. Bell; Western—T. G. A. Evans and E. K. L. Pollard; Yorkshire—F. Caff and G. Byram; Southern—C. F. Williams and P. Bosworth; South Wales and Monmouthshire—E. H. Vokes and S. V. Griffiths.

* * *

New Man-made Fibres. The issue of the *Financial Times* for July 18 gave some interesting information of developments in the synthetic fibre field. Of special interest is the possible competition between Chemstrand Ltd., a recently formed British subsidiary of the Chemstrand Corporation, and Courtalds Ltd. Chemstrand's plan to build a plant in Northern Ireland for the manufacture of Acrilan, a similar Courtald product being Courtelle. Both fibres are derived from ethylene oxide, via acrylic polymers, from which Orlon also has its source. Synthetic fibres of this type are used for high bulk knitwear, wool blends, etc.

Orlon was a considerable disappointment to its manufacturers, Du Pont, in the early days of its career, but it has now established a place for itself by virtue of the warm handling and resilient characteristics, normally only obtainable in fine wool textiles.

The background to the announcement of the new acrylic fibres is that Courtalds already have a pilot plant in operation. Chemstrand's plant is likely to begin production in January, 1959. Chemstrand Corporation of America is a joint subsidiary of the Viscose Corporation and Monsanto Chemical Company.

* * *

Cable-laying Economy. One of the early developments in the use of polythene for agricultural cold water piping was the opportunity for putting piping underground by means of a mole plough, thus eliminating the necessity for costly and time-wasting ditch digging. This technique seems to have been extended by the Post Office authorities for the purpose of cable-laying. The *Shrewsbury Chronicle* for July 13 notes the report of the roads and bridges committee of the County Council in respect of special polythene cable which will be laid nine inches below the ground. Highway authorities were not in favour of this because of the increased risk of damage but the Post Office have now agreed that no claim will be laid in the event of damage to the cable. A polythene insulated cable would of course be very highly resistant to damage and any possibility in this respect would be offset by the economies achieved by laying the cable mechanically.

* * *

Ekco Report. The annual general meeting of E. K. Cole Ltd. was held on July 19 at Westcliff-on-Sea. In the course of a lengthy statement Mr. Cole, chairman and managing director, referred to the activities of the company's plastic division. He made a special point of the company's policy to produce articles of high quality in the domestic field, with the object of promoting a steady growth of sound business. He said that this policy might not lead to spectacular results but would be in the best interests of the organization.

This viewpoint is very much in common with that of the managing director of the B.I.P. Group, Mr. C. H. Glassey, who, through the Melamine Committee has restricted the sale of melamine powder to those companies who will agree to maintain minimum standards of quality. The raw material manufacturers and the fabricators are both well advised to insist upon quality as the pre-eminent factor in any sales policy. The public has come to expect good quality products from plastics for use in the home, to such an extent that it will now refuse to purchase poor quality, cheap and un-identified products.

The housemark of E. K. Cole's domestic products is "Gold Seal." The establishment of high quality products of this kind, clearly identified with a trade name, is the best of all steps to ensure growing markets in this field.

* * *

"Plastics Engineering." This is the title of a monograph, published by Cleaver-Hume Press Ltd., 31 Wrights Lane, London, W.8, price 3s. 6d. It comprises chapter 19 of the volume entitled "Machine Workshop Technology" (Part 1 Materials and Processes) edited by Professor H. Wright Baker. The chapter has been reprinted in monograph form for the benefit of those who whilst not wishing to refer to the whole book, nevertheless require the basic information on plastic materials. The chapter was compiled by Dr. F. T. Barwell, of the Mechanical Engineering Research Laboratory of the D.S.I.R. The monograph is well illustrated and documented and contains valuable tabular information.

* * *

Glass Fibre Telegraph Poles. Successful experiments have been made in Michigan with telegraph poles 35 ft. in length manufactured from polyester/glass fibre materials. These poles weigh 150 lb. compared with 600 lb. for a wooden pole of similar length. Authorities will now study the weathering characteristics of these poles with considerable interest. Termite and woodpecker attack, a problem of great magnitude in America is, apparently, eliminated with the new poles.

* * *

Inspecting Laminates.—Increased use of reinforced laminates in the construction of small boats and in other marine applications has spurred the need for objective inspection techniques for these materials. Visual examination and tapping tests, currently used for examining laminates, are dependent on the skill of the operator. Visual inspection was reported to be the best present test for laminate quality where the material was translucent.

Improved means for inspecting glass-reinforced plastic laminates nondestructively have been devised in research conducted at Battelle. Three promising inspection techniques were described in a paper by A. J. Schwarber, Jr., of Battelle, and W. R. Graner, Bureau of Ships, USN, presented February 8, 1956, at the 11th Conference of the Society of the Plastics Industry, in Atlantic City, New Jersey. These techniques utilize ultrasonic or electrical energy to determine thickness and detect such flaws as delamination and porosity.

In ultrasonic through-transmission testing, the specimen is passed between a crystal generating ultrasound and another crystal receiving the ultrasound. Such an inspection must be conducted in a suitable sound-transmitting fluid such as water or oil.

PLASTIKON.

Mains Frequency Electrical Induction Heating for the Plastics Industry

Part 2. Injection Moulding, Extrusion

By W. E. LORTON and M. A. CRASKE

Injection Moulding

THE contrast in performance of injection moulding machines when fitted with either resistance or induction heaters is probably even more marked than on compression moulding. Some thermoplastic materials are extremely critical as to moulding conditions and they tend to emphasise the unevenness of resistance heating. Nylon is, of course, the outstanding example and many different methods of controlling it and enabling production to proceed smoothly have been tried. That some degree of success has been achieved is obvious from the large number of nylon mouldings being produced, but what these cost in time, trouble and spoilt material can only be conjectured.

Much attention has been given to the design and equipment of special nozzles for nylon. They have been altered in size and shape, and features to prevent either unplasticized grains or too fluid material passing through have been introduced. These are basically attempts to remedy the ill effect of uneven heating by physical means. Separate heaters and temperature controls are also used in an attempt to correct heating faults of the main chamber in the nozzle. If the nylon is brought to and held in the right condition in the heating chamber it is only necessary to avoid chilling it in the nozzle.

The heating chambers themselves have been redesigned in the hopes of getting better heat distribution and all round heating. These redesigns appear sometimes to ignore the basic fact that when heat is distributed by conduction the temperature must fall with increasing distance from the source. It is difficult to see how useful heat can be got into the spreader by conduction without a temperature gradient such that there is a risk of scorching at the inside surface of the cylinder walls.

Different methods of controlling the temperature are also being tried out. The two principal methods are the use of standard types of control but with alterations in the position of the thermocouple in the cylinder wall and the use of proportional controllers. Both methods are basically attempts to alleviate the ill effects of two features of resistance heating—the high temperature gradient across the cylinder wall and the time lag between the controller switching the source of heat on or off and an effective change in temperature at the surface from which the material being processed derives its heat. In other words the delay due to slow conduction.

When resistance band heaters are replaced by induction units, the picture changes. Heat is generated internally instead of externally, throughout the walls and in many cases in the spreader as well. There is little or no temperature gradient across the walls and the whole system is instantaneously affected when the control switch operates.

More of the internal surface of the heating chamber is raised to a temperature at which it can contribute heat to the material and the mean level of temperature at these surfaces is raised. Plasticization is therefore faster and more thorough. The elimination of temperature gradients and variations means that the material is consistently treated without either scorching or incomplete plasticization.

These effects are attained by using induction heaters on heating chambers of standard design as normally fitted to machines in general use and with standard temperature control systems. Some cylinder designs are, however, more responsive than others and Beanwy Electric Ltd. have produced designs specifically to take advantage of induction heating. In these the plasticizing capacity is increased and a greater throughput of consistently plasticized material can be obtained without any risk to the continuous operation of the machine or the quality of the product.

Practical Achievements

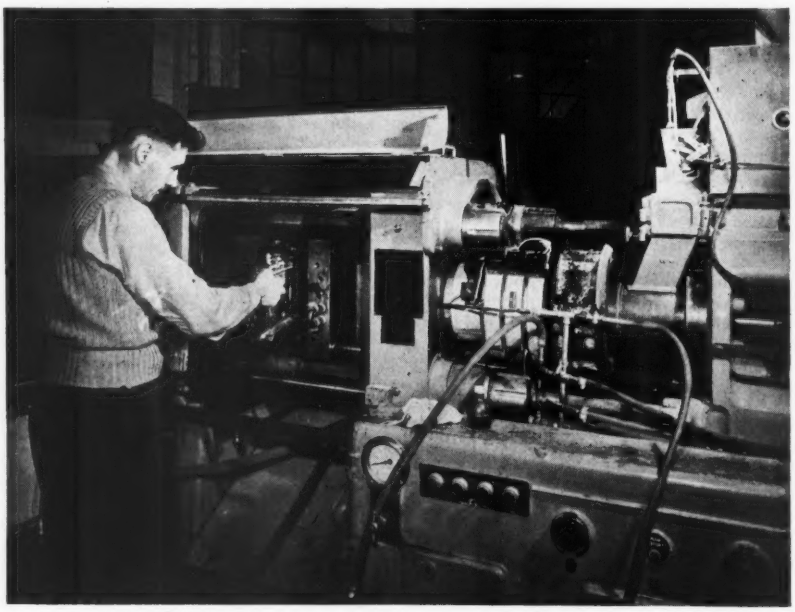
An outstanding practical proof of these facts is the case of a machine moulding nylon components. With resistance heating production frequently alternated between mouldings with grains of unplasticized material in them and scorched mouldings, there was a high scrap rate.

The process of letting down the heat before the lunch hour break and restarting again afterwards was complicated and uncertain and always entailed some waste of material. The adjustment of supplementary controls to meet changing conditions through the day was a time wasting nuisance.

The conversion to induction heating eliminated all these troubles. Production proceeds smoothly and speedily, the scrap rate is negligible and the machine can be left standing all through the lunch hour with the heat full on. This ability to stand for an hour with the heat full on and nylon in the chamber fully illustrates the steadiness and evenness of induction heat. No elaboration of controls or other variations in design are necessary to achieve this result.

Another example also concerning nylon moulding is of a fully automatic machine for the production of small components at a high rate of work. This machine had resistance heating. Starting up was purely a matter of trial and error and continuous production depended on the success of attempts to stabilize work output to heat input. Any variation in the work rate or the condition of the material meant a loss of balance and a further period of spoilt work waiting for restabilization. When this machine was converted to induction it could be in good production 20 minutes after switching on and from then onwards it could be left unattended. The production rate of good quality mouldings increased by 20%.

Following this improvement with the standard cylinder it was decided that a new cylinder should be made up specifically for use with induction heating. In addition to other changes it was found possible to increase the internal volume slightly because of better heat availability. The user now claims an output



Induction heating fitted to an injection cylinder.

2½ times greater than originally. At the same time the control system has been simplified.

Problems

Similarly improved results have been achieved with other materials. One of the problems of the injection machine engineer is to inject the material into the mould at a consistent and even pressure. Many mouldings are spoilt, material is wasted and heating cylinders are cracked due to the inability to achieve the consistently even transmission of the ram thrust through the chamber to the nozzle. This is very largely a heating and not a mechanical problem. The material will always flow through the cylinder in a consistent way if it is always raised to the same temperature in the same position and time.

Some attempts to solve the problem by mechanical means are more likely to aggravate it. For instance, an increase in the thickness of the cylinder walls increases the lag in the temperature reaction inside the cylinder to the outside band heater. The downward swing of temperature is therefore increased and plasticization of the material further delayed. If the delay coincides with the forward stroke of the ram the packing up of unplasticized material is almost inevitable and the results unpredictable.

The application of induction heating solves this problem. More heat is available where it is wanted, at a higher mean temperature and it is immediately replaced as each cold shot enters. Plasticization occurs sooner in the time and space within the chamber and the material is much less prone to pack. Accurate holding of the temperature level means that conditions are consistent at all positions through the chamber and so reactions to the ram pressure are consistent.

Many of the moulders' problems are due to the same cause. When some mouldings have streaks of scorched material in them and others have grains of semi-plasticized material, some have good smooth surface finish and others crack and craze, when the material sometimes flows evenly through thin sections and sometimes does not, the trouble is usually in the heating. When all the heat has to come from a source outside the chamber, the inward flow depends on contact between the heater and the cylinder and on conduction from the outer skin to the transfer surfaces. There are bound to be inconsistencies in the level of temperature and the availability of heat where it is wanted. The condition of the material and the quality of the moulding reflect these variations.

That this is now more fully acknowledged by the machine designer is evidenced by the use of preplasticizing units. The designer says in effect that it is no use pretending any longer that consistent plasticization can be secured by using resistance heated chambers of standard design.

If the preplasticizer is heated by external resistance heaters the inconsistencies of this method of heating are continued. However, more time and space in which to correct under plasticization is provided and the risks of scorched material are reduced because holding the material under heat for a longer time permits a lower average temperature to be applied. Whether it is necessary to go to the lengths of fitting the preplasticizers is not proven. The improved performances which have been secured merely by changing over to induction heating appear to justify more trials with it before accepting an increasing elaboration of machinery and controls.

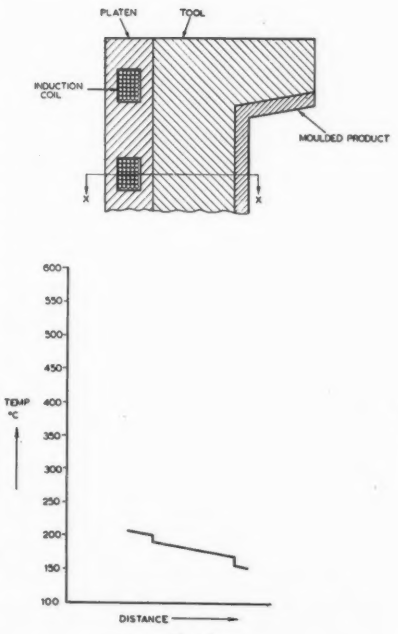


Fig. 6a.

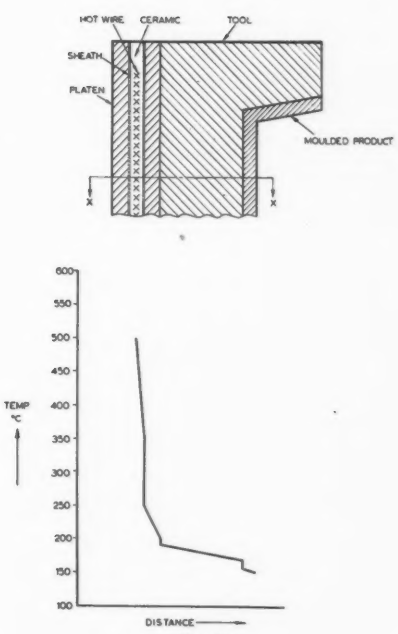


Fig. 6b.

Extrusion

Where the characteristics of the material being processed are such that frictional heat is a significant part of process heat requirements, cooling instead of heating may become the major problem. Where frictional heat does not make an effective contribution however, induction heat will help the process.

As in the other moulding processes the use of induction reduces variations in the level and distribution of the heat, so reducing variations in the condition of the material and the quality of the product. In the manufacture of piping for instance, induction heating will help to eliminate variations in bore and wall thickness.

As with injection moulding, if the material has characteristics which make it difficult to process, the advantages of induction are made more apparent. A feature of induction which has previously been mentioned has been found very useful in extruding high melting point materials. This is the ability to concentrate heat without any loss of reliability. If it is necessary to get a large volume of steady heat in a small length of cylinder, induction will give best results.

This feature has in fact been of considerable use in producing Terylene film. Due to the special characteristics of the material it is essential to control the melting position quite accurately.

Both the temperature level and the actual situation where the melt takes place must be known and precisely controlled. By fitting a high loading, short length induction heater in the right position both requirements can be fulfilled. Experience in this field has led to the use of induction heating for nylon extrusion and it has been found of considerable help.

Consumption and Power Factor

Reference has been made above to decreased electricity consumption with induction heating. The main reason for this is the reduction in radiation and convection losses because of the elimination of a localized high temperature heat source. These losses are in proportion to the differential between the source temperature and ambient, with induction the faces from which losses occur are at a lower temperature, see Fig. 7. A secondary reason is the lowering of transfer losses. There is a fall of temperature when conducted heat has to cross a junction even when the two faces forming the junction are in reasonably good contact. There are a number of such junctions between the hot wire of a resistance element and the point of use. Although the conversion factor of current into heat in the wire itself is good, subsequent transmission losses are inevitable, see Fig. 6a and b. Generally speaking equivalent results can be achieved with about 20% less consumption when induction is used.

The electro magnetic characteristics of a magnetic material alter with increasing temperature. When the current is first switched on to an induction heated platen, mould or

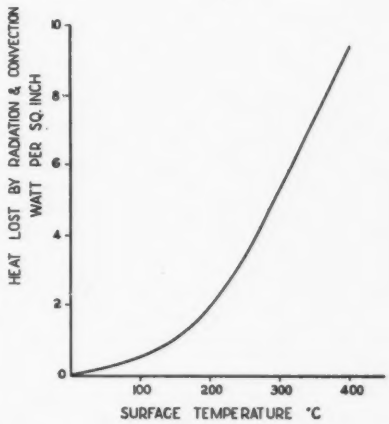


Fig. 7.

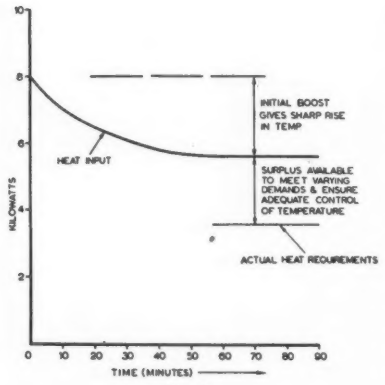

INITIAL BOOST GIVES SHARP RISE IN TEMP
HEAT INPUT
SURPLUS AVAILABLE TO MEET VARYING DEMANDS & ENSURE ADEQUATE CONTROL OF TEMPERATURE
ACTUAL HEAT REQUIREMENTS
KILOWATTS
TIME (MINUTES)

Fig. 8.

cylinder, the load is greater than when the operating temperature has been reached.

The fall may be anything from 15% to 35% according to the temperature and whether the material is cast iron or steel. (Fig. 8.) This is a helpful feature since the high initial load gives a quick heating up and the automatic reduction as the working temperature is approached helps to give even conditions. For general purpose moulding a loading which is able to give the working temperature within an hour of switching on is able to cater for radiation convection and conduction losses and process heat when switched on for about half the working time. This generalization will obviously be varied by the weight and shape of the mould, the weight of the shot, the frequency of operation and other variable factors. Equable conditions will be maintained as long as the current is on for from two- to three-fifths of the working time.

On platens the consumption is about .45 kw./hrs. per hour per square foot of platen working surface. This is an approximate figure for moulds of average depth and a mould to air temperature differential of 155° C. Where the coils are installed directly into moulds the consumption is approximately halved.

Platens and mould should, of course, be insulated from the press. Hard asbestos cement board is generally accepted as being a good material. A thickness of 1 in. is recommended for use when the working temperature does not exceed 200° C. but up to 2 in. may be used with advantage if there is sufficient daylight to accommodate it. For temperatures from 200 to 300° C. the 2-in. thickness is most desirable. Any lesser thicknesses than those recommended entail greatly increased consumption of electricity due to increased loss of heat to the press.

The power factor of induction heating is quite high, by good design under normal loading conditions it is usually in the region of .9. Where high temperature materials are being processed and priority in design considerations must be given to the concentration of heat, an input loading 3 or 4 times greater than that practicable with resistance loading is possible. In these conditions the power factor may fall to .75.

Induction coils work at a temperature which does not exceed the temperature of the platen or cylinder. This is one of the factors in giving a long life. For instance, if there is any oil leakage the coil temperature is insufficient to cause carbonization and so no short to earth is created.

For operating temperatures up to 200° C. coils of normal construction have a virtually indefinite life. For higher operating temperatures up to 300° C. an improved construction will give a life expectation of 2 or 3 years, but as temperatures increase above this the life decreases. It has nevertheless been found practicable and profitable to employ these induction coils at 350° C. and above because the improvements in temperature control and other production features have outweighed the disadvantage of a life reduced to six months or thereabouts.

Applications

The following are the ways in which induction heating is being used in the plastics industry.

1. Complementary to steam heating for compression moulding either in the form of platens or direct installation in moulds. The purpose is to introduce a greater measure of flexibility, increase production and decrease scrap.
2. Replacing steam heating where the capital cost of renewing steam plant has been found to be greater than that of a changeover.
3. Replacing electric resistance platen heating for compression moulding because of better moulding conditions, and reliability and economy.
4. Replacing electric resistance heating for injection and extrusion cylinder heating because of greatly improved production and quality.

The Authors wish to thank the Directors of Beanwy Electric Ltd. for assistance and permission to use material included in this article.

EXAMINATION QUESTIONS IN PLASTICS TECHNOLOGY

Education in the plastics industry is not always a subject calculated to arouse the widest interest; nevertheless, each year a small number of young men sit for the examinations of the Plastics Institute and the City and Guilds of London Institute. To them these examinations represent the culmination of as much as five years' concentrated study at one of the technical colleges of Britain. The successful candidates are men who in years to come will occupy important positions in the industry. It may be important for industrialists of today to realise the sort of questions that are set in these examinations. A few extracts are given below from the Associate papers for 1956 of the Plastics Institute. We hope to publish a few more such extracts next month.

GENERAL SECTION.

(ii) INDUSTRIAL ADMINISTRATION.

(*Time allowed* 3 *hours.*)

Answer Question 1 and FOUR others. All questions carry equal marks.

1. **Compulsory.**

Either

Describe how you would set about getting your information if you were given the task of preparing a detailed report for your management about a technical process or managerial system which had not previously been used in your firm but which your management contemplated trying out.

Or

Write a short essay on "The part played by reading in the study of management."

2. What is Work Study? Discuss its usefulness in the plastics industry.

3. Describe the work of the purchasing officer in a plastics concern.

4. Draw the organisation chart of a factory manufacturing plastics and comment on any points of special interest.

5. What is the force of the word "unofficial" in the expression "unofficial strike"? What, in your opinion, would the occurrence of a number of such strikes in an undertaking signify, and what measures would you consider its management should take in these circumstances?

6. Write a short essay on "Trade Unionism Today."

7. What do you consider to be the most important changes in industrial law since the second world war? Give reasons for your choice.

8. Draft a Works Suggestion Scheme.

SECTIONS A (iii), B (iii) AND C (iii).

TECHNOLOGY OF PLASTICS—MATERIALS AND PROCESSES (Second Paper).

(*Time allowed* 3 *hours.*)

Answer SIX questions only. All questions carry equal marks. Answers should be illustrated by sketches wherever possible.

1. List the principal applications of polyvinylchloride, stating in each case the properties that make it suitable for the particular application.

2. Formulate a polyvinylchloride compound to be used for insulating wire for a domestic electrical circuit. State in detail how you would compound the mix either by an internal-mixer/roll-mill technique or by a dry-mix technique. Compare and contrast these two methods.

3. Describe how high-frequency preheating is used when moulding phenolic material. Give reasons for preheating the moulding material. How can high-frequency heating be extended to the heating of moulds?

4. By means of an annotated sketch describe a single-screw extruder. How would you use such a machine to produce a tube in cellulose acetate butyrate? What precautions would you take or what modifications would you make to maintain dimensions to a close tolerance?

5. Describe the injection moulding of Nylon-66. Indicate the properties and uses of Nylon-66 mouldings.

6. During the past year modified polystyrenes have appeared on the market. What are these? What are their special properties and limitations? Describe two applications for these new materials.

7. Prepare a report to your firm on the advisability of setting up a department for the manufacture of polyester/glass-fibre compositions.

8. Write an essay on *either*

(i) the future of ebonite (hard rubber) as a moulding material,

or (ii) the use of expanded plastics.

9. Copolymerisation of a second monomer with vinyl chloride produces materials of special interest to the plastics industry. Enlarge on this statement.

High Molecular-Weight Nylon

Part 3. Properties as a packaging material

By W. STINER *

Parts 1 and 2 of this article were published in the June and July issues of "Plastics"

AS we stated at the outset, the polyamide plastics—like all plastics—may be looked upon as products which supplement both other plastics and natural raw materials. Table No. 4 below will serve to illustrate this fact.

From this it is possible to deduce the following points in regard to Grilon as a raw material for foil production:

(1) Its outstanding mechanical strength can be compared only with that of polyterephthalic acid glycol ester foils (Mylar). This is true as regards tensile strength, compressive strength, bursting strength and folding endurance.

The high-viscosity types, F35 and R50, show the same mechanical strengths which are typical of polyamides of the caprolactam type. This concerns especially the tensile- and compressive-strength, surface hardness and elastic modulus. On the other hand the high molecular products show different bending strengths and impact strengths. The different flexing strength to an angle of 30° is 30 times higher for grade F35 as compared with A25G. The number of flexes up to break is over 10^6. This has of course a great influence on the folding strength of a Grilon foil. The impact strengths of F35 and R50 are also substantially higher than those of normal polymerizates.

These indications show, that raising the molecular weight is not only of advantage for manufacturing, but also of importance where continuous bending stress and high impact strength is necessary as in pipes and foils.

(2) Its heat resistance is characterized by the fact that Grilon foils will withstand wet sterilization up to 130° C.–140° C. If atmospheric oxygen is excluded, it can be continuously subjected to temperatures of about 150° C.

(3) Chemical Resistance: It is in this connection that polyamide foil may be regarded as a true complement to polyethylene. The latter is absolutely stable against the action of acids at temperatures below 70° C., whereas the polyamides only possess a limited resistance to such acids. This can easily be understood on account of the hydrophilic nature of the amino/carboxylic acid groups. To make up for this, the polyamides possess an outstanding resistance to solvents. Alcohols, ethers, ketones and both aliphatic and aromatic hydrocarbons have no effect whatever on this type of plastic material, nor have any of the fractions obtained in the petroleum industry, even those fractions containing sulphur compounds (mercapthane, etc.) which attack other plastic materials.

* Holzverzuckerungs — A.G., Zurich.

TABLE 4

	Grilon	Polyethylene	Rigid p.v.c.	Plasticized p.v.c.	Saran	Cellulose Acetate	Mylar
Spec. Weight ...	1.13	0.92	1.38	1.27	1.68	1.25-1.35	1.4
Yield per m^2kg. (foil 0.01 mm.) ...	95	109	72.5	79	60	74-80	70
Transparency ...	poor/good	moderate	good	poor/good	poor/good	good	poor/good
Flame resistance ...	self-extinguishing	as wax	good	dependent on formulation	good	fair	
Heat resistance ...	150° C.	appx. 80° C.	80° C.	70° C.	80° C.	70-100° C.	150° C.
Low temperature resistance ...	−10° to −20° C.	−70° C.	0	−20° C.	−30° C.	−10° C.	0
Gas permeability ...	very slight	high	slight	dependent on formulation	moderate	high	slight
Permeability to steam	high	slight	moderate	moderate	very high	high	slight
Water absorption ...	high	very low	moderate	moderate	swelling	high	low
Tensile strength kg./mm.^{2} ...	800–2,500	150–200	300–600	70–300	300–350	200–1,000	1,600–2,000
Chemical Resistance							
strong acids ...	soluble	very good	good	poor/good	soluble	moderate	
weak acids ...	moderate	very good	good	good	soluble	good	
strong alkalis ...	good	good	good	moderate	soluble	poor	
weak alkalis ...	good	good	good	poor/good	good	good	
solvents ...	very good	moderate	moderate	moderate	moderate	soluble	
oils	very good	moderate	moderate	moderate	moderate	moderate	

Wrapping Foils

In view of the properties described previously, Grilon foil is a very interesting addition to the various types of foil available for packing foodstuffs and similar products and it is capable of opening up many new possibilities in the wrappings section of the plastics processing industry.

The special considerations which have to be borne in mind when using polyamides for wrapping foils may be set out as follows:

(*a*) Flavour-retaining properties: For many types of wrapping, such as those used for coffee, tea, soup powders and so forth, it is essential that the wrapping foil used should retain the small quantities of organic compounds which are responsible for the smell and flavour of the foodstuff or other product. Polyethylene and polystyrene foils leave something to be desired in this connection, whereas Saran foils and hard p.v.c. foils give more satisfactory results. Polyamide foil has a very high degree of imperviousness to flavours and consequently promises to be popular in this connection.

(*b*) Its stability to vegetable and animal oils and fats marks Grilon out as being particularly interesting for wrapping products which contain a large proportion of oil or grease.

It is possible to wrap edible oils, butter, grease, cocoa, etc., in polyamide foil, which may be backed with paper if desired. But in addition to this, it is also possible by deep-drawing this foil to make boxes which are suitable for packing preserved foods (packed fish, sardines in oil, meat in brine, etc.).

(*c*) Taste tests carried out on sensitive foods show that Grilon has no effect on the smell or flavour even after a long period of time has elapsed. As there is no need for any qualms in regard to polyamide plastics from the physiological point of view (in fact in some countries this material has been used successfully for bone replacement in living bodies), all that has to be done is to subject the product to a special post-treatment which removes practically all the monomeric components which are left in the granulate after the polycondensation of the ε-caprolactam, because of the manner in which the polymerization equilibrium is regulated. When these have been removed, the product has no effect whatever on sensitive foodstuffs and allied products.

(*d*) Polyamide plastics are inert and provide no food value for ants, rodents, insects, etc. Furthermore it is impossible for mould cultures to grow on them. It is also possible to add suitable organic compounds of mercury to the plastic material itself, and thus even prevent moulds from growing on the product so wrapped. Naturally, in view of the marked toxicity of these compounds, the method

cannot be applied when packing food and similar products.

(*e*) In many cases it is desirable for gases such as oxygen or carbon dioxide, which can be given off by vegetable products, to be able to pass through the foil wrapper. In other cases, absolute imperviousness to gases is necessary. Polyamide foil possesses a high degree of imperviousness to oxygen, nitrogen and carbon dioxide, whereas polyethylene and most foil products apart from Saran foils let gases pass through them to a greater or lesser degree.

(*f*) Generally speaking a wrapping foil is expected to be impervious to water vapour, either to prevent products containing moisture from drying out or else to make it impossible for moisture to get at products which it can spoil. Grilon possesses a very high permeability to water vapour.

(*g*) Although Grilon foil shows a considerable permeability to water and also a marked swelling in water (approx. 8–10%), the decrease in mechanical strength even when the foil contains its maximum quantity of water is only very slight. The moisture which it takes up acts as a natural plasticizer which increases the flexibility of the foil or bag.

There is no leaching out of substances from the foil, because there are no plasticizers in grade F35, and any monomeric products which possess a high water solubility have already been removed by subsequent treatment before the product is used.

Before it was technically possible to produce blown polyamide foils or flat foils on extruders, there were other polyamide foils on the market. These are foils made from solutions of polyamide mixed polymers, principally nylon–6 6 and nylon–6. These foils were not able to come into wide use, mainly because this process of foil manufacture, with its very complicated solvent recovery plant, is not an economic proposition. From the technical point of view, the production of extruded foils is far more economical. In addition, " solvent foil " or " cast foil " possesses the disadvantage as compared with " extruded foil " that it shows a considerably greater degree of swelling when in contact with organic solvents. In many cases, in fact, the resistance to solvents of pure, i.e. single polyamides, is a decisive factor for using them, whereas the mixed polymers can be dissolved easily, for instance in alcohol. The swelling of mixed polymers in water is also greater. In fact, it is possible for actual disintegration to take place in boiling water, whereas foils which are made of a single polyamide can be subjected to wet sterilization in saturated steam at a temperature of 130° C. without suffering any damage. Generally speaking, foil made from mixed polymers has a slight yellowish discoloration, which is not experienced so much in Grilon F35. On the other hand, it is somewhat easier to obtain transparency in the case of cast foils and the flexibility of " cast foil " is greater.

TABLE 6

PERMEABILITY COEFFICIENT x 10^{10} OF GASES

	Grilon	Polyethylene	Proportion
Nitrogen ...	0.0123	1.9	1 : 155
Oxygen ...	0.0471	5.9	1 : 117
Carbondioxide	0.23	35.2	1 : 153

(*h*) When Grilon is used as a wrapping foil, the product can be filled while very hot with a view to ensuring absolute freedom from bacteria.

Welding

It is possible to make bags from blown tubes by a system of welding, or, alternatively, it is possible to use extruded foil which is folded in special machinery and embossed with longitudinal and transverse grooves. When welding Grilon foil, two factors come into play; the sharp melting point, and the comparative fluidity of the melt together with its sensitivity to oxygen at high temperatures. Consequently, any type of welding which is carried out must be done with equipment which permits the accurate regulation of the welding temperature. The most suitable welding temperatures is at about 50–30° C. above the melting point, that is between 245 and 265° C.

For welding thin foils having a thickness of less than 0.15 mm. the heat impulse process has been found very suitable. In this process the foils are heated either from one side or from both sides by a heating strip, and the heat is conducted through the foil to the weld point, due to the heat conductivity of the material.

TABLE 5

PERMEABILITY OF FOILS AGAINST VAPOURS OF SOLVENTS

(Grms. solvent per 100 cm.² per 24 hours using 0.1 mm. thick foil at 20° C.)

	Grilon	Cellulose Acetate	Polythene	Saran	Mylar
Water	0.3	2.7	0.01	0.002	0.015
Methanol	5.0	22.0	0.05	0.0015	0.0025
Ethanol	0.5	12.0	0.05	0.002	0.02
Isopropylalcohol ...	0.2	3.7	0.018	0.0015	0.03
Acetone	0.03	*	0.26	2.6	0.035
Methylethylketone	0.01	*	0.3	2.1	0.035
Ethylether	0.01	16.2	8.0	0.08	0.15
Dioxane	0.004	*	0.4	*	0.0025
Tetrahydrofuran ...	0.02	*	7.0	*	0.005
Ethylacetate ...	0.01	*	0.75	1.15	0.03
Chloroform ...	0.3	150	18.0	2.6	0.9
Carbontetrachloride	0.003	0.04	15.0	0.02	0.1
n-Hexan	0.05	0.1	14.8	0.01	0.05
Gasoline	0.002	0.013	6.6	0.015	0.006
Benzene	0.006	6.6	11.0	1.0	0.085
Ammonia, conc. ...	0.1	12.8	0.06	0.01	0.03

* foil is dissolved.

A comparison of different foils and their permeability with vapours.

The electric heater strip is fixed firmly to the welding bar and it is a good plan for the latter to be covered with a coating of p.t.f.e. The foil is heated by the application of simultaneous surface loads of up to 300 watts per square centimetre, and the heat then flows from the top foil into the bottom foil, the weld being formed by the pressure of the bar. As a result of the high melting point of the material, it is better to use heat impulse welding equipment which provides for what is known as the double heat feed. If the heat is fed in from one side only, it is necessary for the heater strip to be set at a higher temperature than when two heater strips are used. The result of this higher temperature is that the polyamide may suffer damage due to heat. When this happens, milky patches are produced which are caused by an irregular heat supply.

After the material has been heated, it has to be cooled down to below the melting point whilst it is still under the pressure of the welding bar.

Consequently this process only permits of an economic working speed when using very thin foil. It is very important to see that the welding time (duration of heat impulse) and the cooling time are kept constant, so that the sharp melting point of the material is taken sufficiently into account. Whenever possible, the heat impulse equipment should be controlled automatically.

Unlike high-frequency welding, welding by means of heat impulses is independent of the di-electric properties of the material and is therefore independent of the moisture content or climatic conditions. Nevertheless, it goes without saying that no foil should be processed in this way if it has too high a water content, as the welding will first of all cause the water contained in the polyamide to evaporate, thus giving rise to the formation of blisters.

High-frequency welding is used for foils having a thickness of more than 0.15 mm.

When welding Grilon foils it must be borne in mind that these foils have to some extent been stretched, either longitudinally or transversely, by their method of manufacture, i.e. blowing. When the material is welded together, this molecular orientation is destroyed. During the molecular orientation heat is produced internally, or else the stretching process is itself carried out under heat.

During the subsequent cooling, any internal stresses produced are frozen into the material. During the welding process, these stresses are liberated by the heat and can cause wrinkling. It is easy to see from this wrinkling whether a nylon foil is in an orientated condition. The plasticization brought about during the welding process completely destroys the molecular orientation and this will lead to a considerable decrease in the strength of the material. In an extreme case this may drop to the tensile strength of the unorientated material, which is from 5 to 6.5 kgs. per sq. mm.

When foils made of orientated material are used, this decrease in the strength along the weld seam must always be taken into account if the welded article made of nylon is to be subjected to tension at the seam. This is a point which must be considered separately for every individual case and a decision made as to whether the economical process of welding be used or whether it will be necessary to use the more complicated process of adhesion, with the use of solvents or swelling agents, the long

periods for which the joint has to be closed, and the partial hardening of the adhesive joint. On the other side of the picture is the considerably smaller decrease in strength at the joint when strongly orientated Grilon foils are used.

Another process which has been found to be very suitable with polyamide foils is the deep-drawing process, which has been copied from the deep-drawing of metal plate.

Colouring

Grilon F35 can be processed in various colours. If the material to be enclosed is not sensitive in any way, it is advisable to mix in with the melt stained, dark pigment materials, which absorb ultra-violet light.

Grilon foils can be printed with the following types of dyestuffs:

Erionyl dyes, made by Geigy.

Dispersion dyes, e.g. Cibacet dyes made by Ciba.

Chrome complex dyes, such as Nenyl dyes and acid dyes and chrome dyes.

By using these dyes it is possible to obtain impressions which are resistant to scratching and fast to rubbing, because there is a true chemical combination between the dyestuff and the polyamide. The usual printing processes can be used.

Resistance to Staining

As is well known, the structure of the polyamide macro-molecule is very clearly related to protein structures. There is an indisputable similarity to natural silk. It is known today that the capability of polyamide to take a dye depends in the main on the amorphous portions, which play the part of the dyestuff carrier. In a polyamide foil one has to reckon on a considerable proportion of amorphous product. However, the greater the extent to which a foil has been stretched the less dyestuff it will take up.

Various foodstuffs and allied products contain organic compounds which possess certain of the characteristics of dyestuffs, and consequently these may stain polyamide products to a greater or lesser degree. There can be no doubt that this represents a great disadvantage for polyamide when it comes to its use as a wrapping foil.

Investigations carried out in our laboratory have enabled us to discover a method which leads to excellent resistance to dyes. This method is based on the principle of dyeing the polyamide with chemical substances which possess the properties of dyestuffs but whose absorption range lies in the invisible part of the spectrum. The method of treatment is comparatively simple, but it would fall outside the scope of the present report to go into it in detail here.

Blown Bottles

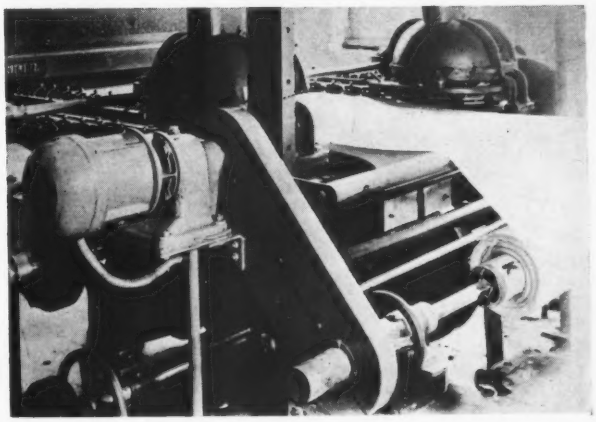
In principle, the same advantages and disadvantages apply as in the case of wrapping foils. The impermeability of the material to odour and flavour is even more important here. Hollow articles of Grilon R50 are not only absolutely resistant to the essential oils in perfumes and other cosmetic products, but they also prevent the perfumes themselves from diffusing through the wall.

Because of the great strength, the wall thickness of polyamide bottles can be less than that of polythene bottles. The fact that the product is completely stable to solvents particularly as regards hydrocarbons, opens up a large number of possible applications.

By their very nature, the price of the raw material of polyamide plastics represents a disadvantage. Nevertheless, there are many special wrapping problems which can be solved with this material and which could not be catered for by the plastics industry in the past. On the other hand, the extremely good strength properties permit a considerable saving in material and, furthermore, this new type of polyamide makes it possible to simplify processing techniques.

GERMAN WINDING EQUIPMENT

Some comments on the Alquist sheet winding equipment now being manufactured in West Germany



The Alquist sheet winding equipment

THE satisfactory winding up of goods coming in endless lengths from production machines, e.g. textile fabrics, rubber, thin wires, or foils, has hitherto been associated with great difficulties. Even today in many plants equipment is still being used that operates with friction discs, guide belts, or similar devices, and, quite frequently, the winding is even done by hand. However, it cannot be denied that friction discs or other appliances working with a sliding action can never perform a completely satisfactory taking-up operation.

A really trouble-free working take-up motion with the greatest possible uniform pulling force requires a torque that rises with the growth of diameter of the roll being wound up. Friction clutches can never deliver this as, in them, the moment of friction remains unchanged, unless the contact pressure exerted on the opposed members of the clutch is steadily increased.

On the other hand, it is of importance that some kinds of film are wound up with a definite and, if possible, constant pulling force since otherwise, due to the appearance of moire effects, by stretching of the product, by creasing, and due to other factors detrimentally influencing the texture, a deterioration of the quality, losses of production, and other damages may occur. Friction discs being employed means that up to 80% of the working energy supplied is absorbed in the production of frictional heat. Further, the frictional force on the contact members wears them out very quickly. Another disadvantage is that the coefficient of friction is dependent on the temperature and humidity which often renders it difficult to adjust the friction clutch so that it will function in the same way after several operating hours as at the beginning, no matter whether it is summer or winter, dry or wet outside.

The drawbacks which must be taken into account with friction clutches are eliminated in the Alquist winder. It consists of a special motor-drive gear, which can be connected to any power line supplying standard three-phase current, and a take-up motion (regulator) for the adjustment of the tensile stress with which the product is to be wound up. The turning and winding moment increases mechanically in proportion with the growth of the circumference of the roll, without any additional manipulations being required. Thus the tensile stress of the product being taken up remains unchanged according to the value set on the scale by means of the take-up motion, so that the quality of the product is not affected in any way and uniformly wound rolls are the result. The tensile strength of the take-up motion can be varied within wide limits which enables the winding to be carried out without tension, or with a certain degree of stretching of the film if that is required.

The Alquist winder is made in various sizes. For the tensionless winding of thin wires or lightweight textile fabrics, low powered and small winders are mostly used whereas, for the winding of heavy and thicker products, winders of greater capacity will have to be employed. The Alquist winder is entirely independent from the main drive of the production machine and there is no need to have it mechanically connected with it.

A conversion of existing winding stations to the employment of Alquist winders offers in many cases substantial advantages benefiting the manufacturing method as well as the product, it is claimed by the manufacturers, the West German firm of Stahlkontor Weser GmbH, Postfach 187, Hamelin/Weser.

The Properties and Testing of Plastics Materials—Part 6.

Sections 1-5—Solubility, Chemical Resistance, Resistance to Oil, Water Resistance, Permeability

By A. E. LEVER,* A.I.R.I., and J. RHYS,† M.Sc.

Section 1. Solubility & Dilution Ratio

A NEW method using an ultra-centrifuge for determining solubility, taking cellulose acetate as an example, is given (1). For control of polymerization processes solubility measurements are important (2). In linear polymers solubility decreases as the chain length increases.

Dilution Ratio

This is of value in the surface coating industry. It indicates to what extent a solution of a polymer will tolerate dilution by a non-solvent before being thrown out of solution. The higher the degree of polymerization the more easily it will be precipitated. Hence a rise in the dilution ratio during a process indicates degradation of the polymer.

For control work standardize under any suitable conditions, e.g. 5% solution at 20° C. Place 20 ml. solution in a flask and run in the non-solvent. The end point is when a faint permanent haze is formed.

$$\text{Dilution ratio} = \frac{\text{volume of non-solvent}}{\text{volume of solvent}}$$

References

1. Resins, Rubbers, Plastics Abs., 1949, AO, 421, 759.
2. Fundamentals of Synthetic Polymer Technology. Elsevier. 1949.

Section 2. Chemical Resistance

THE choice of types of test, concentrations, period of immersion, etc., are purely arbitrary, and one should bear in mind the end use of the material or product.

A comprehensive investigation in which the gain or loss in weight, and any dimensional changes is reported (1). To isolate the effects of chemical reagents upon the flexural strength and stiffness, especially the effects of weak acids, it is necessary to make control tests on specimens immersed in water.

The effect of solvents on organic plastics (2), the chemical resistance of phenolic laminates (3), the effect of immersion in motor fuels (4), and a new corrosion test for plastics (5) are all of interest.

An empirical test for determining loss of plasticizer or other extractable components from plastic film when immersed in liquids commonly used in the home is given (6). The loss or gain in weight is reported.

Resistance to hydrofluoric acid of various plastics is reported (7).

The composition of the A.S.T.M. (8) reference fuels is:

Fuel A	.. 100% iso-octane.
Fuel B	.. 70% iso-octane.
	30% toluene.
(9) No. 1 (SR-10)	100% di-isobutylene.
No. 2 (SR-6)	60% di-isobutylene.
	20% toluene.
	15% xylene.
	5% benzene.

References

1. A.S.T.M. Spec. D.543–52T.
2. *Ind. Eng.*, 1942, **34**, 764.
3. *Trans. Am. Soc. Mech. Eng.*, 1947, **69**, 795.
4. *Trans. Am. Soc. Mech. Eng.*, 1950, **72**, 175.
5. *Chem. Eng.*, 1949, **56**, 98.
6. A.S.T.M. Spec., D.1239–52T.
7. A.S.T.M. Bull., 1950, No. 167, 60.
8. Hycar Tech. News Letter, 3–3, 3/1954.
9. *Mod. Plast.*, 1941, **19**, 59, No. 4.

Section 3. Resistance to Oil, Grease and Stains

FOR the determination of oil resistance consult specification (1). Special plastics, e.g. non-rigid vinyls (2), have separate specifications. This specifies oil with an aniline point of 70 ± 2° C. Details of the apparatus are given.

Resistance to Grease

Reference is made (3) to the T.A.P.P.I. Test No. 454-m-44, the turpentine test for grease resistance of paper. The test was used for investigating kraft paper coated with a vinyl latex, and is as follows:

A drop of turpentine, containing a red dye, is placed on the coated paper at the point of intersection of right-angled creases. The degree of grease proofness is determined by the length of time taken for the turpentine to penetrate the film and stain the paper. To pass the test the paper must remain unmarked for five minutes.

A method is described (4) for determining the solubility in fats, greases, etc., of polyvinyl chloride films used in packaging (toxic properties are discussed also). Another method is given (5).

Resistance to Stains

A British specification (6) deals with laminates used in the building trade. It deals with stains caused by hot water, alcoholic liquids, and by hot edible fats.

Resistance of flexible table tops to food stains was investigated (7) by applying small quantities of mustard and catsup for 24 hours.

A list of the staining materials and methods of test for laminated products (U.S.LP.2-1-10) is given (8).

References

1. A.S.T.M. Spec., D.543–52T.
2. A.S.T.M. Spec., D.744–49T.
3. Br. Geon Ltd. Bull., G.6.
4. *Ind. Eng.*, 1949, **41**, 2276.
5. *Mod. Pack.*, 1948, **21**, 147.
6. B.S., 1323–1946.
7. *Mod. Plast.*, 1950, **28**, No. 2, 111.
8. Plastics Eng. Prod.—SPI., 1954.

Section 4. Water Resistance, Absorption, etc.

THE estimation of the moisture content of cellulose acetate is covered by a British Specification (1). A Dean and Stark apparatus is used in (2) with petroleum ether as the immiscible liquid.

The moisture content of adhesives for plywood is determined in (3), and the results are interpreted in terms of suitability.

An apparatus for determining small amounts (ca. 1%) in synthetic rubbers is described (4). It is simple, rapid, and precise, and is essentially a distillation with toluene.

A description is given (5) of the Karl Fischer Process for estimating the moisture content of plastic moulding powders to ± 0·5%.

The moisture content of some plastics, e.g. cellulosics and nylon, which are hygroscopic is of great importance. An equilibrium is established between the moisture content and the ambient humidity. This has a deleterious effect on the quality of the mouldings produced. Trade literature should be consulted. The speed with which some materials absorb moisture from their surroundings make it imperative to test in the same atmosphere as that in which they were conditioned (6).

Water Absorption

The American Specification (7) points out that tests for water absorption have two chief functions:

(i) As a guide to the proportion of water absorbed, and, consequently when the relationships between moisture and electrical, mechanical properties, dimensions, or appearance have been established, a guide as to the effects of this water on those properties.

(ii) As a control test.

This practical specification calls for not only a report on the water uptake, but also on the dimensional changes which take place.

For cellulose acetate see (1).

Methods for determining the water absorption of phenolics are covered in (7). The British standard (9) uses moulded discs (1.97 in. diameter and 0.47 in. thick). There is a critical discussion in (8) where it is suggested that the determination of extractibles may be neglected in the water absorption test for phenolics without altering its practical value. There is a useful discussion on the British and American methods of test (21). It is concluded that for satisfactory comparisons the rate of penetration must be measured as well as the saturation value.

Laminates for building purposes are tested according to (10). A table is given showing the

* Consultant. † F. W. Berk and Co. Ltd.

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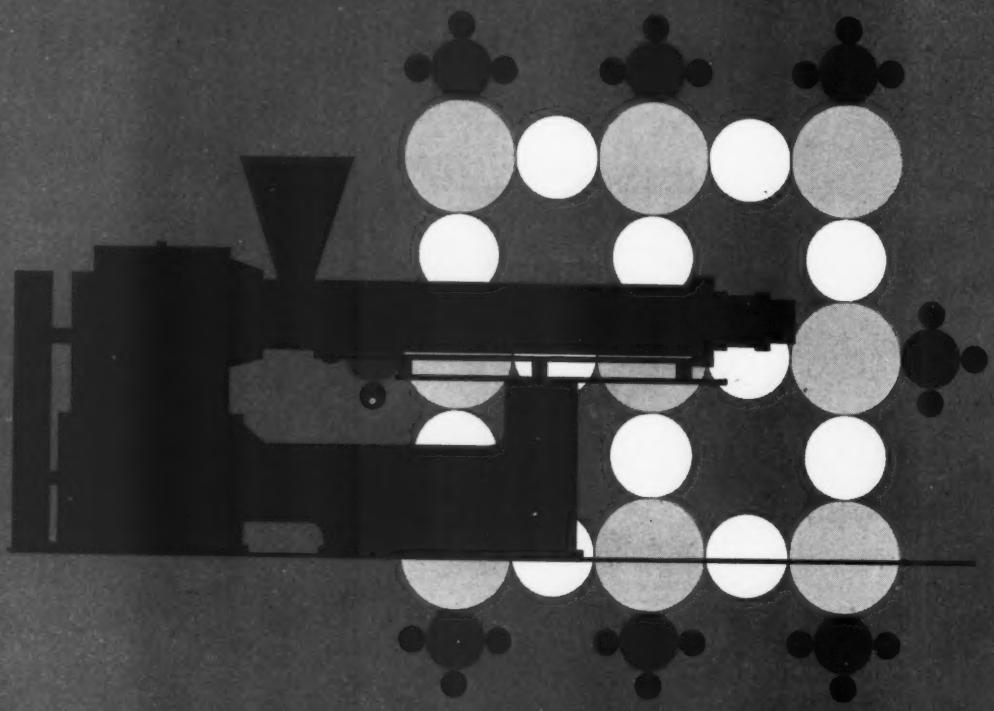

Out-of-the-ordinary

I.C.I. Silicone Rubbers are certainly out-of-the-ordinary materials. They retain their elasticity at temperatures down to —85°C, where natural rubber would become rigid and brittle, and will withstand continuous exposure at temperatures up to 250°C—and higher for short periods—without decomposing. In addition they combine excellent electrical properties and exceptional ozone resistance. Yet, when it comes to processing, I.C.I. Silicone Rubbers present no special problems. With excellent general moulding and extrusion properties, they are frequently easier than natural rubber to process on standard equipment.

I.C.I. SILICONE RUBBERS —*Material Progress*

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maximum permissible water absorption for each sheet thickness.

The measurement of the water absorbing property of surfaces is discussed (11), and a new apparatus is described in detail. This may be of great value in determining the water absorption of protective coatings.

A method is described (19) which permits investigation of very small samples—1 mg. upwards.

The effect of moisture on electrical properties for phenolics and cellulosics is dealt with in (12), and its measurement and effect on nylon fabrics in (13).

Commenting that blistering is one of the basic moisture problems in the paint industry, data is presented (14) on tests made with a variety of films. Permeability measurements and moisture sorption measurements were made on vinyls, silicones, acrylics, phenolics varnishes, polyvinyl acetate, chlorinated rubber, GRS latex, and on conventional finishes. A blister test box was made in which moisture enters coated wood panels at the back. When the wood is saturated moisture begins to accumulate at the paint-wood interlace. The results are reported and discussed.

Care must be exercised in determining water absorption when water soluble material is present. This is very important with, e.g. amino plastics (20).

The effect of humidity is discussed at some length (15), and there is a good bibliography. Water acts as a plasticizer for many plastics, and tends to increase ductility and toughness, but to reduce strength and modulus. The combination of high temperature and high humidity will increase the amount of water absorbed, and so accentuate these changes.

The role of moisture content of cellulosics cannot be overestimated as small quantities affect the surface of the moulded articles causing blisters and scaliness on injection moulded pieces. As a general rule the moisture content should not exceed 0.5%.

Extraction of and by Water

Activitated carbon is used in a water extraction test for plasticized polyvinyl chloride sheet (16). This is recommended because of the low plasticizer solubility in a limited volume of the extractant. Static water extraction by carbon is approximately equal to extraction by continuous water exchange, and the water does not become saturated with plasticizer.

The extraction of plasticizer by water is accelerated when soap is present (17). Di-2-ethylhexyl phthalate which is sparingly soluble in water, and has a low extraction rate, is extracted by soapy water at high enough rates to render the plasticized film unsuitable for applications where frequent laundering is necessary.

A method of scum titration for determining the solubility of plasticizers in water is described (18).

Resistance of Surface to Boiling Water

A procedure for testing laminated products (U.S.LP2-1-07) is given (22).

References

1. B.S. 1524–1949.
2. B.S. 756.
3. B.S. 1203–1945.
4. *Rub. Chem. & Tech.*, 1952, **25**, 704.
5. *Plastics* (London), 1946, **10**, 99.
6. Elastomers & Plastomers. Elsevier. 1948.
7. A.S.T.M. Spec., D.570–42.
8. *Br. Plast.*, 1949, **21**, 328.
9. B.S. 771–1938.
10. B.S. 1323–1946.
11. *Off. Digest*, 1953, No. 344, 618.
12. *Elect. Man.*, 1950, **6**, 46.
13. *J. Text Inst.*, 1949, **40**, T.170.
14. *Off. Digest*, No. 353, **26**, 387.
15. Symposium on Plastics. A.S.T.M., 1944.
16. A.S.T. Bull., 1952, No. 183, 75.
17. *Ind. Eng.*, 1954, **46**, 1344.
18. *Analyst*, 1943, **68**, 303.
19. *Kolloid Z.*, 1943, **105**, 16.
20. B.S. 1322–1946.
21. *J.C.S.I.R.*, 1947, **20**, 503.
22. Plastics Eng. Hand.—S.P.I., 1954.

Section 5. Permeability

THIS is defined as the volume of gas (corrected to N.T.P.) which passes through unit area of a material in unit time when the partial pressures of the diffusing gas on the two sides of the material differ by a given amount, normally one atmosphere. It is usually expressed in litre per square metre per 24 hours. The term is also used in connection with the passage of water or water vapour through a material.

Information is given in (1) on the permeability of a large number of plastic films for common gases, and it is concluded that:

(1) Permeability increases with temperature.
(2) The rate of flow of gas is proportional to the thickness.
(3) There is no correlation between permeability and molecular weight.
(4) Permeability increases with increased plasticizer content.

To avoid confusion reference should be made to the expressions p.v.c. and C.P.V.C. used in paint technology (2) as this is of importance when pigmented films are considered. P.v.c. is the recognized abbreviation for polyvinyl chloride, but C.P.V.C. stands for critical pigment volume concentration, and is used to describe the pigment concentration by volume at which the voids in the packed pigments are just filled by the vehicle. Any increase in pigment concentration above this value will lead to voids in the film and a consequent increase in permeability to vapours, water, and to electrolytes. An apparatus for measuring the C.P.V.C. is described in (3).

For estimating the water permeability of sheet material various types of dishes were investigated for both the desiccant and the water methods (4). A constant pressure diffusion cell was used in (5) and (6). Results are reported, and also in (7).

The permeability of 21 polymeric films to oxygen, hydrogen, carbon dioxide, nitrogen, ammonia, hydrogen sulphide, and sulphur dioxide were studied (8). The apparatus is described and the results. Another report (24) covers helium in addition, and shows that most of the permeabilities increase exponentially with temperature. (9) Is confined to the measurement of permeability towards oxygen and carbon dioxide.

The determination of water vapour permeability is sidely reported. Ref. (10) describes a rapid method based on the use of radioactive hydrogen. Another apparatus is given in (11), and (12) is concerned with the temperature dependence of this permeability. The diffusion of water in high polymers gives rise to an electric current which can be measured on a sensitive electrometer, e.g. the Hoffman Electrometer with a sensitivity of 1.6×10^{-16} coulombs (14). Another investigation (13) describes a registering microbalance for diffusion measurements. The ratio between current and weight increase is recorded automatically.

Vapour permeability measurements were made (15) by placing the reagent in aluminium

DIFFUSION OF WATER THROUGH VARIOUS PLASTICS AT 25° C. (5)

	Thickness	D × 10^8
Polyesters and polyamides—		
Polyethylene sebacate—cast	0.1005	7.91
Acrylated polythene sebacate	0.0845	7.21
Polyamide—6–6 DuPont	0.498	11.03
Polyvinyl chloride and copolymers—		
Koroseal 12104—moulded	0.0630	3.50
Polyvinyl chloride/acetate 95/5 moulded	0.0524	0.70
" " " " " + 10% inorganic filler + 30% T.C.P.	0.0513	2.73
" " " " " + 10% " " + 30% D.O.P.	0.0543	4.65
" " " " " + 10% " " + 30% Santicizer M17	0.0398	4.43
" " " (87/13)	0.492	1.12
Butvar (29/95 aldehyde/vinyl)	0.0962	6.43
Cellulosics—		
Cellulose acetate A-17—moulded	0.0979	114
" " " —acetone-cast	0.0402	287
" " " —commercial sheet	0.0542	38.4
" triacetate—moulded	0.1027	71.2
" acetate butyrate—moulded	0.0950	52.2
Ethyl cellulose—moulded	0.1005	76.8
" cellulose, plasticized—moulded	0.0601	16.0
Cellulose nitrate—commercial sheet	0.0387	22.5
Miscellaneous—		
Polystyrene—moulded	0.106	3.50
Methylmethacrylate—moulded	0.108	4.07
Urea formaldehyde laminate	0.1043	46.7
Phenolic, unfilled—moulded	0.0974	0.11
Polythene	0.0399	0.23

EFFECT OF PLASTICIZERS ON WATER PERMEABILITY

	D × 10^8
Ethyl cellulose—no plasticizer	77
5% D.B.P.	68
25% D.B.P.	73
45% D.B.P.	118
5% Dow No. 6	73
25% Dow No. 6	33
45% Dow No. 6	22
Polyvinyl chloride/acetate 95/5—no plasticizer	0.7
30% T.C.P.	2.7
30% Santicizer M17	4.4
30% D.O.P.	4.7
30% Flexol 3 GH	36.5

Thwing Albert Vapometer Cups, closing the tops of the cups with the film to be examined, placing in a constant temperature box and weighing at intervals.

Gas permeability data is given (16) using a General Foods Gas Transmission instrument, slightly modified. A description of the standard instrument is given (17) and (18) Vapour pressure measurements on the vacuum side of the film were recorded until constant readings were obtained.

The Bundesman waterproofing test is described (19). The cloth to be tested is exposed to artificially produced rain.

The effect of plasticizers on the permeability of polyvinyl chloride film has an intimate relationship with the functional groups in the plasticizers, e.g. adipates increase it, chlorinated diphenyls decrease it (20). Copolymer film has a higher permeability than polyvinyl chloride film.

The permeability and swelling of cellulosic films was measured (21). A beaker containing anhydrous caustic soda was sealed with a piece of the film under examination, placed in a closed vessel over water, and weighed at intervals to determine rate of diffusion of water vapour into the beaker. Cable sheathing was tested (22) by making a closed bag containing water from a piece of the sheath. This was placed in a desiccator containing phosphorous pentoxide, and weighed at intervals.

The following data is given:

PERMEABILITY

	10^{-8}g./hr./cm./sq. cm./mm. pressure differential
Polyisobutylene + carbon black	0.006–0.08
Polyisobutylene	0.14
Thiokol	0.08 –0.50
Polythene	0.22
Bitumen	0.80
Natural rubber	0.80 –5.0
Polystyrene	3.3
Polyacrylate	31.0
Cellulose triacetate	100.0

An examination is made (23) of three methods for determining the water vapour permeability of Saran film.

(1) Standard cup test—a constant pressure evaluation.

(2) A variable pressure technique on a modified General Foods gas transmission cell.

(3) A high vacuum variable pressure technique.

References

1. *Ind. Eng.*, 1952, **45,** 1148.
2. *J.O.C.C.A.*, 1954, **37,** 310.
3. *Ind. Eng.*, 1949, **41,** 1470.
4. A.S.T.M. Spec. D.697–42T.
5. Symposium on Plastics. A.S.T.M., 1944.
6. *Mod. Plast.*, Nov., 1944, **22,** 155.
7. *Ind. Eng.*, 1953, **45,** 2296.
8. *Mod. Plast.*, 1950, **27,** No. 11, 95.
9. *Mod. Pack.* 1952, **25,** 131.
10. Chem. Ind., 1951, June, 444.
11. *Ind. Eng.* (Anal.), 1944, **16,** 686.
12. *Ind. Eng.*, 1946, **38,** 788.
13. *Kunststoffe*, 1944, **34,** 117.
14. *Kolloid. Z.*, 1942, **101,** 43.
15. *Mod. Plast.*, 1950, **27,** No. 10, 97.
16. *Mod. Plast.*, 1950, **27,** No. 11, 95.
17. *Ind. Eng.* (Anal.), 1944, **16,** 58.
18. *Mod. Pack*, 1943, **16,** 69.
19. *J. Text. Inst.*, 1942, **33,** 350.
20. Rubber Abs., 1954, **32,** 125.
21. *Plastics* (Lond.), 1943, **38,** 49.
22. *Kunststoffe*, 1948, **38,** 49.
23. *Anal. Chem.*, 1950, **22,** 1541.
24. *Ind. Eng.*, 1954, **46,** 733.

Patent Review

The following abstracts have been made from specifications at the Patent Office, with the permission of the controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 3s. 0d. each (including postage).

B.P. 747,931. Wear-resistant gloves. L. C. Reynolds. To: Riegel Textile Corp.

A fabric glove is made wear resistant by a plurality of spots of resinous material applied to certain portions of the glove. Such spots do not interfere with the flexibility and the " breathing " properties of the glove.

B.P. 747,945. Manufacturing multicore electric cables. To: Philips Electrical Industries Ltd. (Netherlands).

Parallel telegraph and telephone conductors are covered with polyvinyl chloride by extrusion, then twisted while heating gently to provide the desired mechanical properties (bending round corners) and mitigate cross-talk in long-distance connections.

B.P. 747,998. Folding containers. To: Unilever Ltd. (Netherlands).

Cardboard container with a lining of thermoplastic film. The sealed end of the lining is attached to the sealed lips at the ends of the flaps opposite the fold lines.

B.P. 748,046. Production of artificial leather having a polyvinyl chloride basis. To: Deutsche Gold- und Silber-Scheideanstalt vormals Roessler (Germany).

A coating or sheet permeable to air and water vapour to a certain extent, but impermeable to water, is made up of a mix of polyvinyl chloride, a plasticizer, a pigment, a swellable macromolecular substance (starch; polyvinyl acetate, polyamides, polystyrene, etc.) and a swelling agent (water; organic solvent). The mix is formed into a coating or sheet and gelled by heating.

B.P. 748,111. Resistor and method of making the same. To: Erie Resistor Corp. (U.S.A.).

A strip resistor with leads resting on the terminal portions sandwiched between plastic sheets which are cured together. Felt like paper fibres impregnated with uncured or partially cured phenolic resin can be easily cut to the desired shape and joined together under moulding conditions. The selection of the plastics depends on these conditions and the desired electrical properties.

B.P. 748,142. Decorative treatment of transparent objects. M. F. Dyson.

To produce " prismatic dispersion " in artificial gem stones a diffraction grating is provided over the whole or part of one face of a sheet of transparent material (glass, quartz, plastic material) with grooves of saw-tooth shape and a maximum depth dependent on the refractive index of the material. The article may be used in jewellery or as decoration for powder compacts.

B.P. 748,155. Decoration of textile materials. C. S. Joynson.

A pattern is first applied to a sheet of greaseproof paper in the form of a paint on the base of a thermosetting plastic material (urea-formaldehyde, melamine, epoxy or alkyd synthetic resin), then the decorated face of the paper applied to the textile material and pressed on to this material. The thermosetting plastic material thus transferred to the textile is cured by applying a hot smoothing iron to the reverse side of the material remote from the paper.

B.P. 748,165. Flame proofing cellulosic materials. W. L. Dills. To: E. I. Du Pont de Nemours & Co.

A flame-proofing composition for cellulosic substances (fabrics) comprises an aqueous monobasic solution of titanium and tervalent antinomy diluted with isopropanol of tertiary butanol.

B.P. 748,326. Device to assist respiration in athletes and others. A. H. Thrower.

The device is moulded from plastic material, transparent and colourless. It is intended to be introduced into the nostril so as to produce a slight distension.

B.P. 748,335. Reflex reflecting sheet. To: The Groh Manufg. Co. Inc. (U.S.A.).

A sheet of polymethyl-methacrylate is embossed on the front side with a multiplicity of flat lens formations. The sheet is laminated to a thin reflecting sheet of metal foil by any suitable thermoplastic cement.

B.P. 748,368. Continuous production of corrugated reinforced plastic material. To: Montecantini Soc. Gen. p.l'Industria Mineraria e Chimica.

Continuous production of rolled corrugated glass fibre mat-polyester resin plastic is characterized by distributing the resin in liquid form from a reservoir on to the reinforcing layer, which is progressively subjected to rolling pressure. Transverse corrugations are formed by moulding in a suitably conditioned atmosphere until polymerization is effected.

B.P. 748,381. Gloves and thumb stalls. Swan, Hunter & Wigham Richardson Ltd., G. Oliver (Italy).

Provided with an upwardly projecting thumb shield to deflect dust and flying chips when drilling, chiselling, grinding.

B.P. 748,395. Strengthened reinforced structures. P. D. de Laszlo.

For making curved boat hulls of glass fibre fabric permeated with a hardenable synthetic resin. A strengthened structure is formed by coating a layer or superposed layers of fabric and ribs on the layers with the resin the whole being formed over a former composed of a series of independent elements. Thus the elongated former is flexible and can follow the curve of a surface though presenting rigidity in the direction perpendicular to the surface.

B.P. 748,409. Boxes of cardboard or like material. R. H. Filmer Ltd., J. W. Filmer.

The corners are strengthened with a heat-sealing thermoplastic compound.

B.P. 748,419. Synthetic resin tiles. W. H. Engel.

The water-repellent surface of a polyvinyl chloride tile has a pressure-sensitive adhesive coating to enable the tile to be stuck on a wall. The coating is protected by its outside backing, a regenerated cellulose film, which becomes easily separable when immersed in water.

B.P. 748,452. Vacuum flasks and the like. L. Leslie-Smith.

An auxiliary container is screwed on to the flask canister.

B.P. 748,475. Construction of vehicle bodies. W. J. E. Mussel. To: L. F. Dove Ltd.

Floor, wall, cant and roof are constructed of panels having inner and outer skins of plastic material with insulating filling sandwiched between them.

B.P. 748,526. Form for making splints and the like. To: N. V. Esta (Netherlands).

Preformed blanks of sheets of solid thermoplastic material are moulded individually to the shape of the desired orthopaedic support when heated. They are provided with a sheet of foam plastic to be positioned between the sheet and the part of the body to be splinted to prevent contact with the skin.

B.P. 748,586. Plastic slide fasteners. To: Novoplast G.m.b.H. (Switzerland).

The two stringers are provided each over its entire length with a row of teeth so shaped that detent flanges are no longer required.

B.P. 748,607. Bonding compositions for bonding surfaces of nylon. C. A. Redfarn, H. Beever. To: Small & Parkes Ltd.

Nylon dissolved in resorcinol and diluted by the addition of methylalcohol.

B.P. 748,653. Dispensing containers. R. F. Lang. To: Metal Box Co. Ltd.

A polyethylene cap with a lateral opening closing the neck of an aluminium container has attached to its resilient top a valve projecting into and closing the neck opening. On pressing down the top of the cap the valve opens releasing a " flowable " product and propellant to pass through the cap opening.

B.P. 748,658. Handles for hand tools. J. Baker.

Use of a pin to limit movement of the tang receiving bush and its spring in the plastic handle.

B.P. 748,696. Process of making abrasive phenolic resin mixes. To: Norton Grinding Wheel Co. Ltd. Comm. from H. N. Stone.

B.P. 748,703. Manufacture of collars of plastic materials. A. O. Tallboy, A. H. Samways, H. R. Denne, W. J. Darley.

Made from copolymers of vinyl chloride and vinyl acetate with doubled edges on the cut blank, which are sealed to form tubular front margins on the finished semi-stiff collar.

B.P. 748,734. Method of producing thermosetting mouldable compositions. To: Rütgerswerke A.G. (Germany).

Refers to a composition in which the resinous binder consists of at least one hardenable aminoplastic resin.

B.P. 748,741. Beach cape change bag. J. M. C. Grant.

Made, e.g. in nylon, plastics, with an adjustable neck aperture and slits for the hands.

B.P. 748,760. Nets, especially fishing nets, and methods and machines for producing and treating same. J. W. E. Haller. To: Linen Thread Co. Ltd.

To eliminate slippage of the knots in nets made from thermo-plastic synthetic resin twine (nylon), the nets with tensioned knots are passed through a heating medium to set the knots.

B.P. 748,913. Process for preparing urea-formaldehyde resin solid foams. To: E. I. Du Pont Nemours & Co. (U.S.A.).

Solid foam of closed cell structure is obtained by emulsifying an inert organic liquid in an aqueous urea-formaldehyde resin solution in the presence of an emulsifying agent, vaporizing the mixture and hardening it using an acid-curing catalyst at a temperature above the boiling point of the liquid. For acoustic and insulating structures and also, e.g. for the chromatographic separation of mixtures.

B.P. 748,990. Resilient foam materials suitable for use in upholstery. To: Dunlop Rubber Co. Ltd. (Germany).

A solid foam made up of a foam rubber constituent and a resilient polyurethane constituent.

B.P. 748,998. Football and like boots. F. J. Shillcock.

A strip of rubber or plastic is attached to the boot by lacing eyelets. It has studs or ribs to engage the ball.

B.P. 749,001. A simplified word-building apparatus. E. J. Hemming.

With two rotatable discs and an intermediate slide on a (plastic) base.

B.P. 749,028. Sink tidies. P. E. Lewis.

An inner container having a perforated base within an outer container.

B.P. 749,041. Sanitary appliances. A. Johnson.

Flexible urine receptacle for attachment to user.

B.P. 749,066. Babies' bibs. F. B. Leese.

A thin P.V.C. sheet (" shield ") has attached thereto an absorbent " feeder " of towelling.

B.P. 749,079. Extruding machines for the continuous processing of fusible or thermoplastic plastics. To: Badische Anilin & Soda-Fabrik A.G. (Germany).

Plastics, e.g. polyamides, have a tendency to settle in the threads of heatable screw presses and then stop continuous extrusion. " Bridge formation " can be prevented by carrying out conveying and compression in one zone which is cooled or only moderately heated, and consolidation, plasticization, melting, softening in another heated zone of the extrusion machine.

B.P. 749,087. Receptacle and dispenser for pins and like articles. F. G. Turner. To: Empire Plastics (Birmingham) Ltd.

A spring biased insert in a cylindrical stand holds the pins. The insert has a conical bottom with a centre hole for the ejector rod so that by pushing the insert into the stand, the rod throws a pin through a central aperture in the cap on top of the insert.

B.P. 749,111. Telephone handsets. H. Junghans.

A portion of the cup-shaped mouthpiece is adapted to engage the mouth of the user in a soundproof manner. Automatic air inlet and air outlet valves with moisture proof diaphragm are provided together with replaceable filters to comply with hygienic requirements.

B.P. 749,116. Drawing board. S. S. Pollock.

The board has a recessed face in which a sheet of a hard resinous substance (" Formica "; " Warerite ") is secured. Drawings are prepared directly on the surface of the resin sheet. They can be readily erased. The T-square may be used along any one of the projecting edges of the sheet. The drawing on the sheet can be reproduced directly from it by a photographic process.

B.P. 749,140. Foot protection devices. R. Holthe (Norway).

Made from an elastic porous material (foam rubber or plastic) to be worn inside or outside stocking.

B.P. 749,174. Screw cap for bottles, tubes or the like. B. A. Fuchs (Germany).

With a longitudinal serrated extension on top to facilitate screwing and to prevent rolling away when dropped.

B.P. 749,181. Glare reducing windshields. R. R. Beckham. To: Libbey-Owens-Ford Glass Co.

A plastic coloured interlayer provides a shaded area in the windshield sandwich. The interlayer has a curved fade-off line to compensate for the effect of the bent windshield.

B.P. 749,183. Television receiver cabinet. B. J. Edwards, D. Jackson. To: Pye Ltd.

Arrangement of an implosion guard formed by a sheet of transparent resin material.

B.P. 749,204. Swimming fins. J. C. Tannock, L. H. Shaw. To: J. C. Tannock.

The fin portion is moulded of thermo-plastic material (polyvinyl chloride) of such stiffness and resilience that when the wearer walks about on land while wearing them the fin portion bends upwards, as the wearer's weight is transferred and does not return to its flat shape before two seconds have elapsed.

B.P. 749,221. Swimming fins. J. C. Tannock, L. H. Shaw. To: J. C. Tannock.

Refers to a harness for securing the fin to a foot of any size of a certain range and which may be worn while walking on land.

B.P. 749,242. Templates or contour boards. R. F. Taylor. To: A. T. S. Co. Ltd.

The board is cut to just approximately the correct contour leaving a gap between the edge of the board and the model. This gap is filled by casting into it a (polyester) resin to supplement the contour to the required shape. For making jigs and templates, e.g. for aircraft wings.

B.P. 749,274. Devices for supporting the legs of furniture. W. L. Goodfellow.

A circular block moulded from a suitable resin around the head of a screw the shank of which projects from a flat top.

B.P. 749,276. Production of moisture-proof sheet wrapping materials. B. Samways, R. L. Lloyd. To: British Cellophane Ltd.

To obtain greater uniformity when applying a moisture-proof layer to the surfaces of two solid films guided to form a nip between them into which a dispersion of the layer is introduced, the films are supported in the nip by two opposite straight edged polished and rounded plates. (Add. to: 663,645.)

B.P. 749,278. Equipment for supporting blood letting lancets. E. J. Poitras.

A multi-lancet rack in which one set of cavities is arranged to hold the cutting portions only while the other set holds lancet cutting portions and handles for storage of used lancets in inaccessible condition.

B.P. 749,343. Lipstick holders. To: L. Tschanz Comptoir de la Parfumerie S.A. (Switzerland).

B.P. 749,366. Surgical collars. To: Williams & Co. Ltd.

To support a patient's head. Formed of a pair of opposed part-collar elements of stiff or semi-stiff material (polythene ; cellulose acetate) which can be heated to be fitted snugly on the wearer.

B.P. 749,407. Liquid dispensing device. B. Strong. To: E. Shipton & Co. Ltd.

A tubular receptacle is fitted through the opening in the neck of a polythene bottle. The receptacle is closed at the bottom; a tube extends from near the bottom of the bottle into the receptacle to the level to which the receptacle is to be filled through the tube when squeezing the bottle. The measured dose is ejected from the inverted bottle by again squeezing it.

B.P. 749,444. Interlocking alphabet letters or the like for toys and other purposes. A. E. Darey. To: Injection Moulders Ltd.

The letters are moulded with horizontal base portions formed with undercuts and projections to be interlocked and joined with adjacent letters.

B.P. 749,497. Method of manufacturing acid-resistant and pressure-resistant articles. E. Hürner (Germany).

Acid-resistant tubing, valve bodies, fittings of polyvinyl chloride or polyethylene lack stability of shape at raised temperature. Aluminium armour cannot be used unless protected against corrosion and only for tubing. An acid-resisting cast resin can be applied to the tubing, etc., as an armour at a temperature below 140° C., although it has thereafter a softening point exceeding 140° C. The resin may be applied by casting or as an impregnant in any fabric tape or by spraying. The tubes may then convey hot media at pressures of more than 6 atm.

B.P. 749,519. Pictorial devices. P. P. Linn. To: Raphael Tuck & Sons Ltd.

A shallow container with opposite walls of transparent plastics is filled with water and flaked paint to simulate falling snow (or silver or gold glitter) over a picture on one of the walls. For greeting or festival cards.

B.P. 749,536. Boxes or like containers. To: Microcell Ltd.

A rigid box body moulded in a single piece from glass fibre reinforced synthetic resin with a reinforcing metal rim and a lid with a rubber seal fitted wholly into the container and held down by rotating clips. The boxes may be used for storage and transport of ammunition.

B.P. 749,541. Method for the production of resilient rollers. O. Loosen, H. Herrmann (Fa. Felix Böttcher) (Germany).

Printing rollers are made from polyurethanes, to which small amounts of plasticizers may be added, in a mould containing the steel spindle. The mass can be introduced by pouring, centrifuging, or injection under pressure. Centrifuging and pressure injecting may be combined to form a centrifuged harder outer layer over a pressure injected softer filling in the space around the spindle.

B.P. 749,548. Air distributor devices. I. M. Stewart.

An air grille with a number of discharge nozzles may be moulded from plastic material in two parts, a main grille plate and a secondary grille plate each with spaced alternating and overlapping ribs defining the air nozzles.

B.P. 749,570. Packings for transporting cinematograph film and the like. G. de Roberto, A. Quattrino (Italy).

A convex barrel composed of barrel staves and exterior hoops with a fixed base and a fixed and a movable (hinged) cover portion. The barrel may be made of plastic material and provided with rubber rings to deaden any impact.

B.P. 749,614. Cricket bats. J. Lewis, Rubber Improvement Ltd.

To the surface at least of the playing part of the bat is stuck a layer or layers of rubber or plastic backed by or interposed with, layers of textile material bonded thereto. The plastic may be polyvinyl chloride, polyethylene, nylon or high molecular weight styrene.

B.P. 749,636. Pouring device. L. H. McRobert, E. E. G. Boite. To: Cerebos Ltd., Bettix Ltd.

The quadrant-shaped pourer of U-shaped cross-section to be fitted in a slot on top of a salt container is moulded from a resilient plastic. It has lugs to be forced through the slot, then to spring apart holding the pourer in rockable position.

B.P. 749,647. Method of and apparatus for the fabrication of doors made of resin-impregnated fibrous materials. To: Montecatini So. Gen. per l'Industria Mineraria e Chimica (Italy).

Made in a single operation.

B.P. 749,665. Thread bobbins. H. G. Fairweather. Comm. from: Heminway & Bartlett Mfg. Co.

Packages having paper shells or metal packages have a tendency to spin and release undesired thread length when used on sewing machines. This package refers to a thread of synthetic resinous material, e.g. nylon which normally has plastic memory. The thread is provided with a coating of a resinous material which is more compressible than the thread material, non-adhesive at normal temperature but adhesive above 140° F. The wound package is axially compressed at a temperature at which the coating becomes adhesive. On cooling and pressure release, the package springs back a little but unravels only under sewing tension.

B.P. 749,733. Production of cellular bodies from polyvinyl chloride. H. Newby. Comm. from: Chemische Werke Hüls A.G.

Hard cellular bodies are obtained when mixtures of polyvinyl chloride, a ketone resin and a blowing agent are heated to gelatinization temperature.

B.P. 749,753. Catheters and like drainage tubes and the manufacture thereof. E. A. Mansell, J. G. Franklin & Sons Ltd.

Produced by dipping a preformed plug mounted on the distal end of a former into a tube containing a plastic composition.

B.P. 749,775. Footwear. M. Goldman.

Sole and straps of a sandal for indoor or seaside wear are moulded from thermoplastic material in one piece. All parts are symmetrical inside and outside so that sandals for the right and left feet consist of identical mouldings.

B.P. 749,779. Manufacture of lengths of synthetic plastic material and synthetic plastic coating of strip material. S. F. Deakin. To: Edison Swan Electric Co. Ltd.

For coating strip material (wire) with polytetrafluoroethylene. The material is forced around the wire through a restriction duct of progressively reduced cross-section and subjected at the same time to supersonic vibrations and subsequently to heating.

B.P. 749,805. Gauges and process for making the same. H. Sauter, W. Hahn. (Hahn & Kolb), Siemens Halske A.G.

A pair of metallic members on a holder are adjusted on a precision gauge block in a mould. Molten plastic material is then cast into the gap between feeler and holder. The gauge block is removed when the plastic has solidified.

B.P. 749,808. Line indicator for knitting patterns. M. Albon.

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Sheets allowing the rearrangement, addition or removal (typewritten; printed) information. A flexible transparent plastic carrier sheet has guide channels on both sides along the edges into which item strips may be clamped. The flexible character of the carrier permits the use of rotary printing apparatus.

B.P. 749,903. Ash trays for cigarettes and the like. E. P. Aghnides (U.S.A.).

A two-part tray with two nested bowls. Channels between the inner and outer bowl serve for extinguishing the butts.

B.P. 749,919. Apparatus for the production of blown foils of hard polyvinyl chloride. H. Newby. Comm. from: Chemische Werke Hüls A.G.

Prepared with the aid of an endless screw press in which the ratio of the space between the first threads of the screw to the space between the last threads of the screw is 3 : 1 to 5 : 1. The blowing head is internally free from obstructions before the annular orifice instead of having the usual comb insertion.

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B.P. 749,941. Ash trays for cigarettes and the like. E. P. Aghnides (U.S.A.) (div. out of 749,903).

B.P. 749,942. Device for producing identification or other marking on gramophone records. F. W. M. Power.

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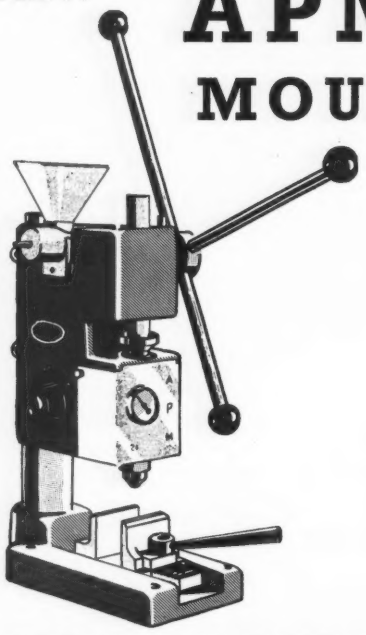

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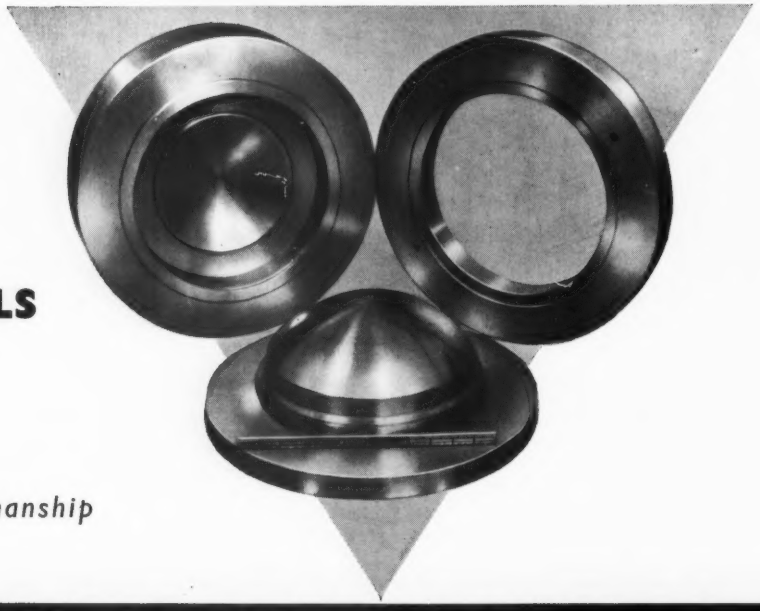

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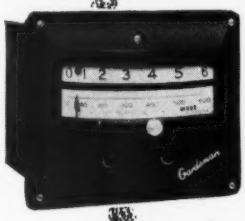

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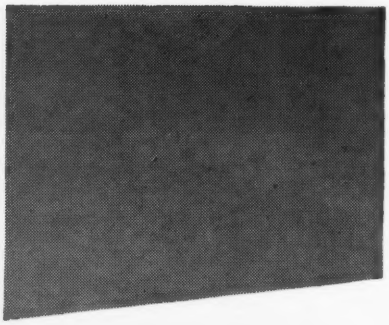

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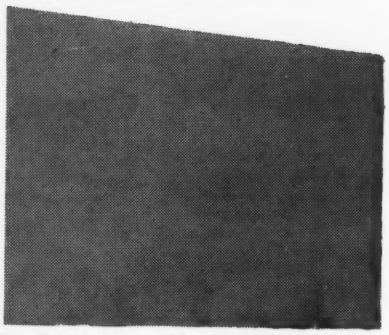

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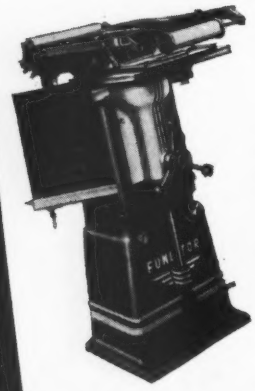

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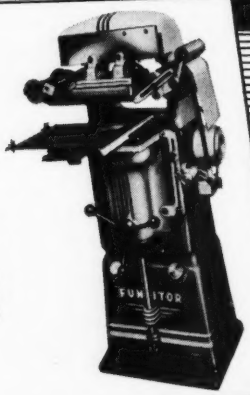

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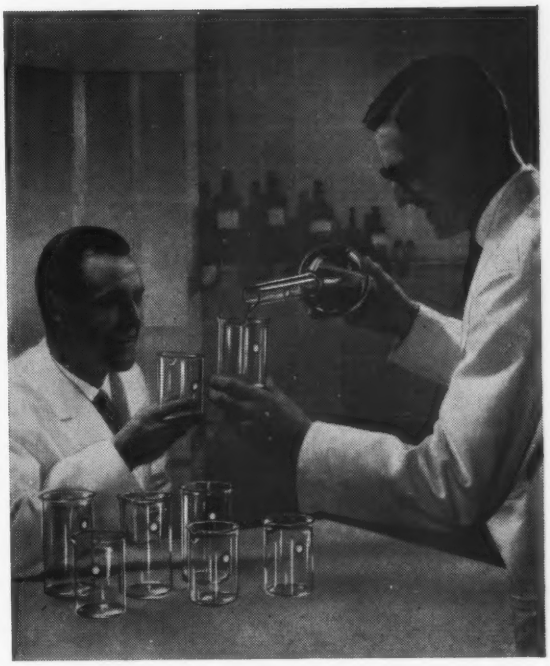

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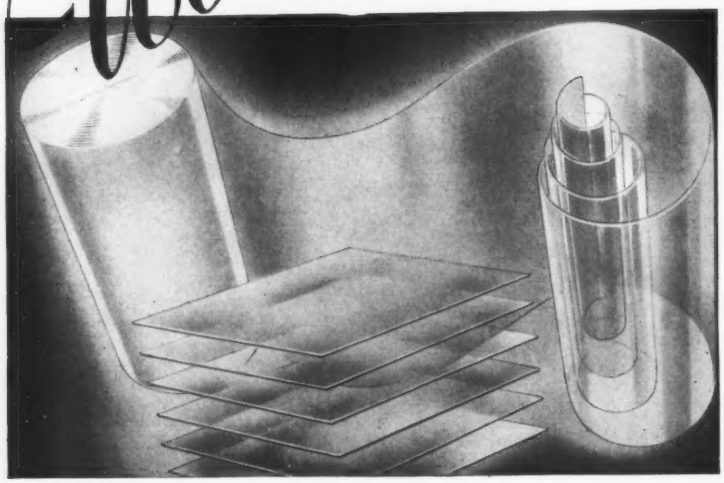

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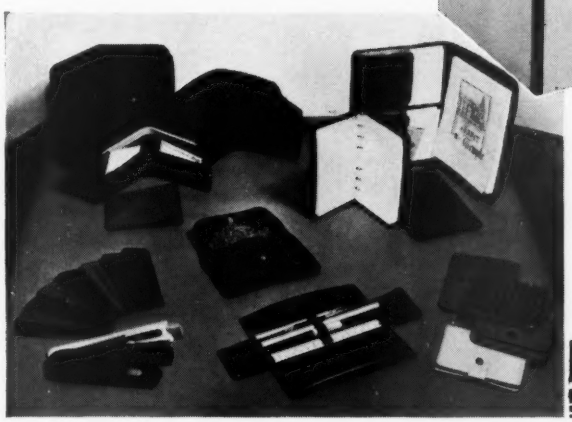

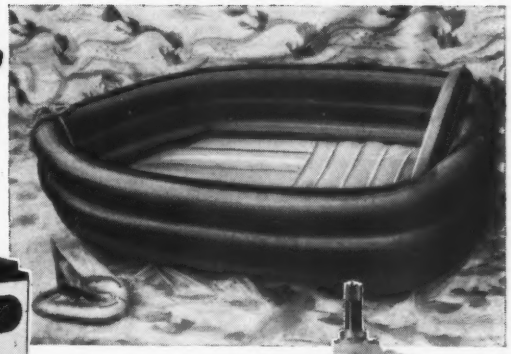

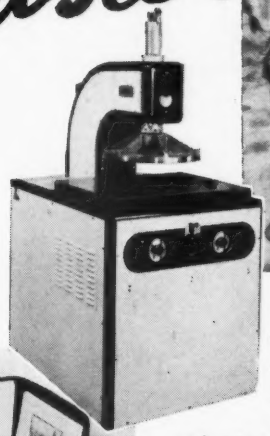

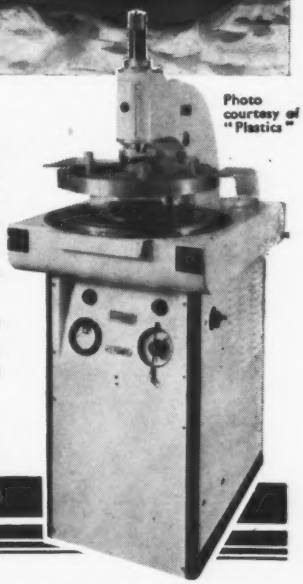

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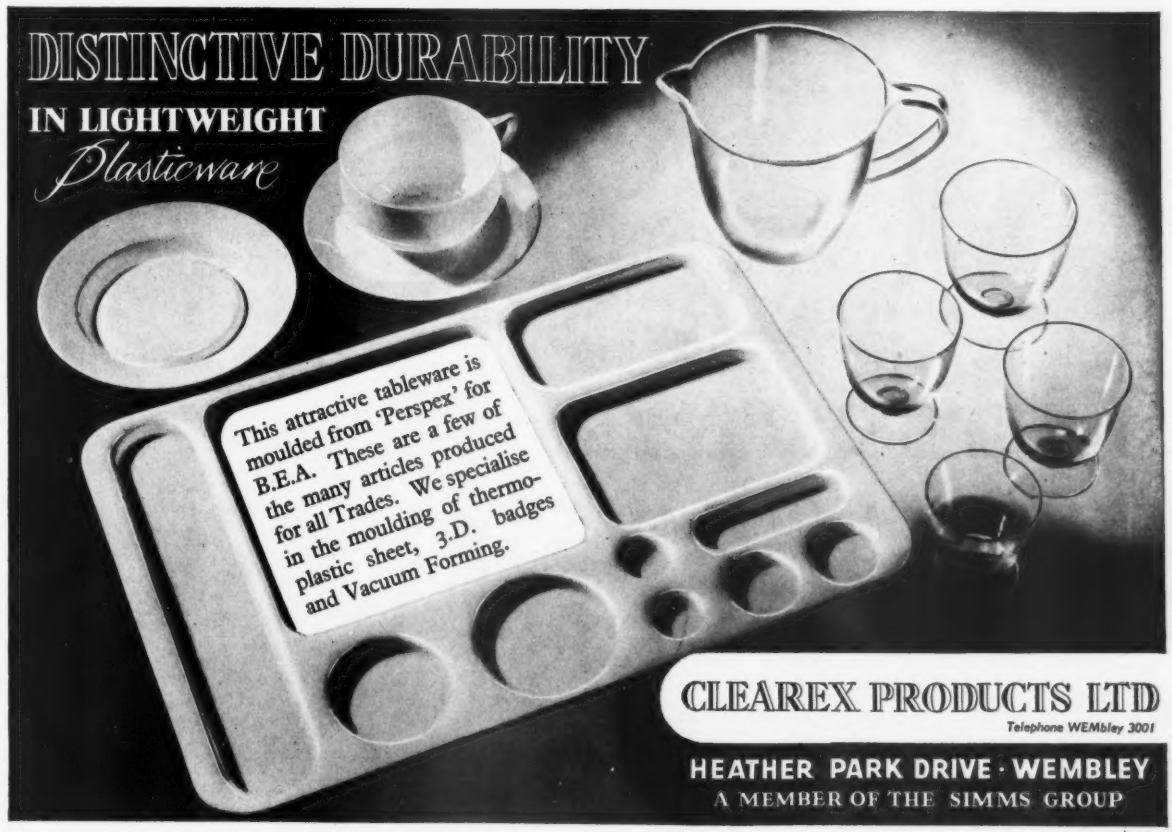

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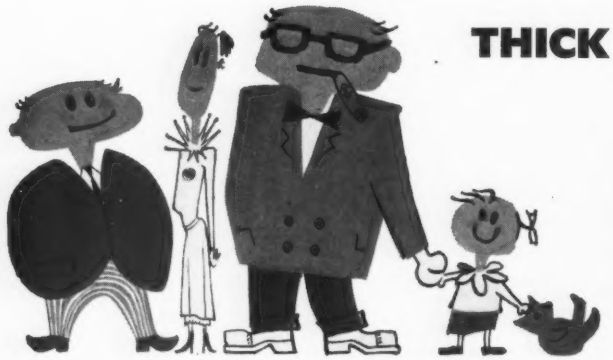

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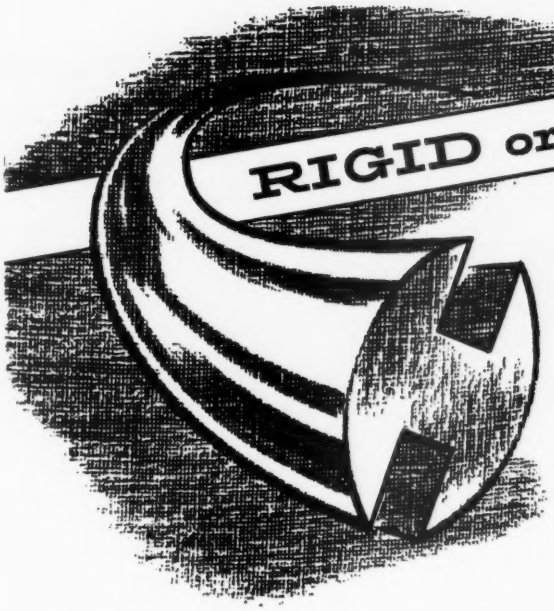

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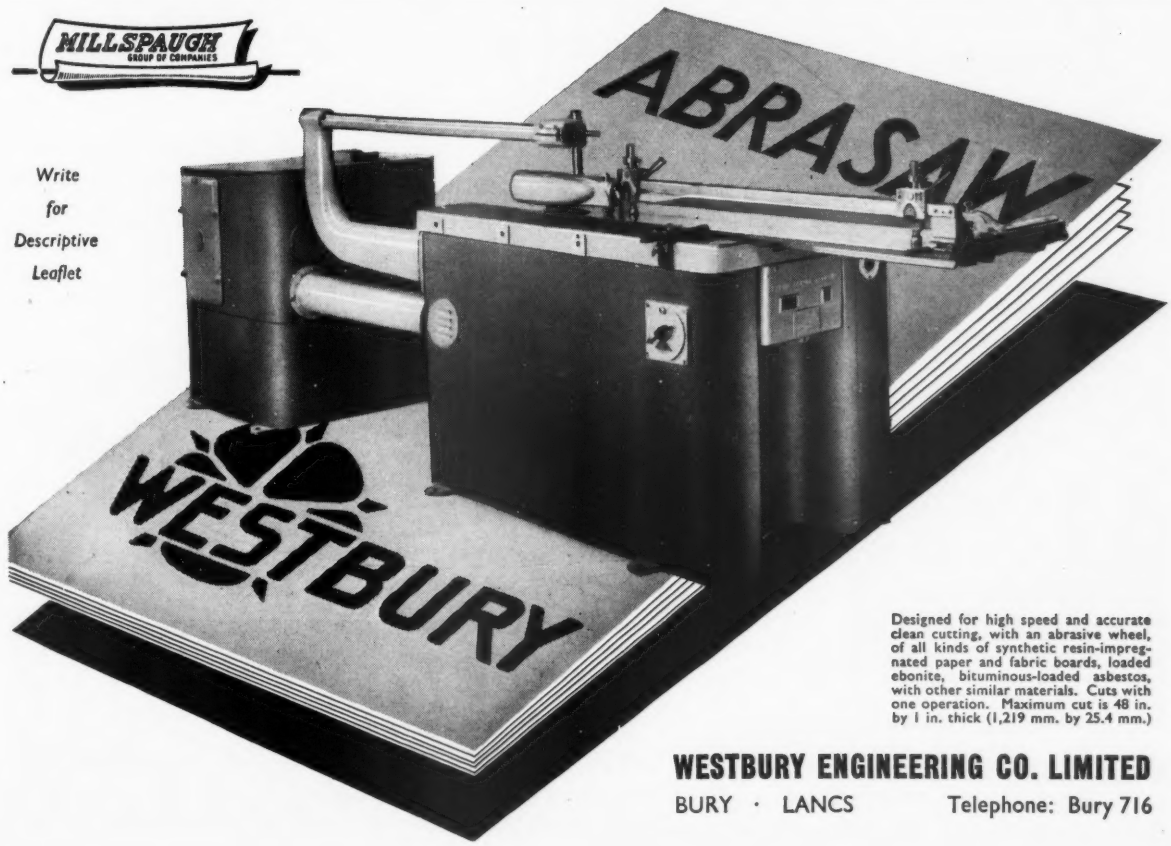

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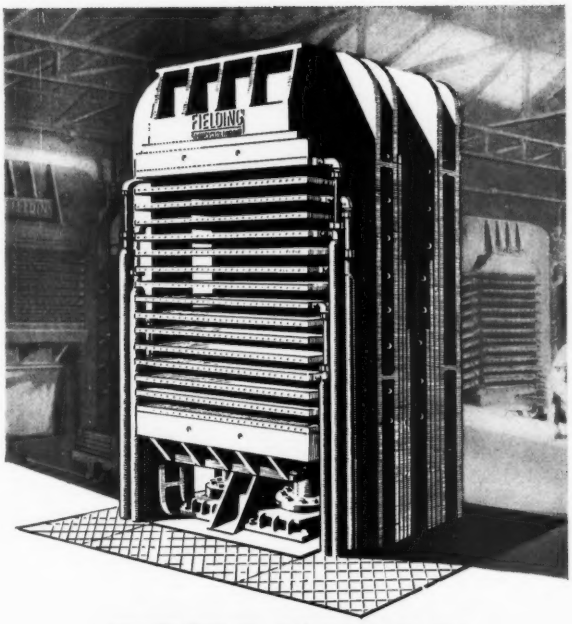

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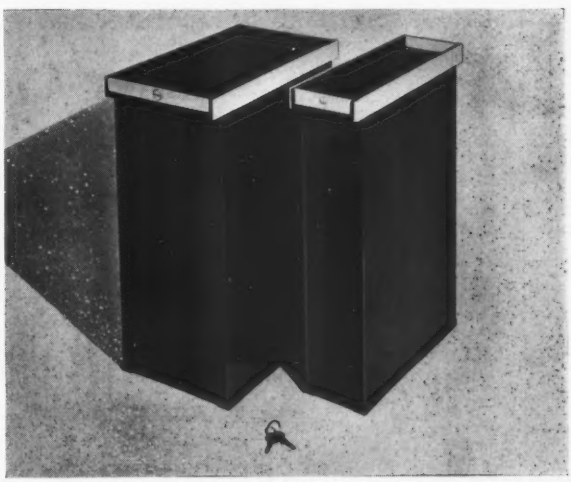

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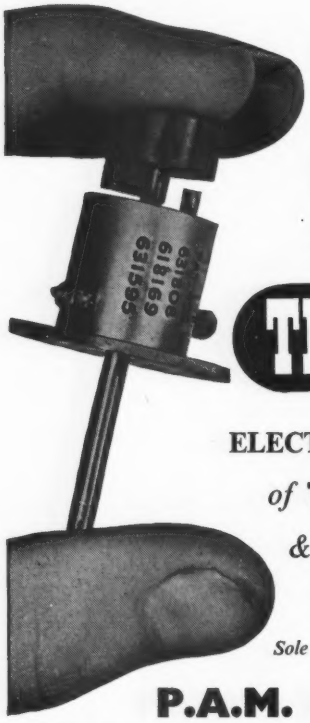

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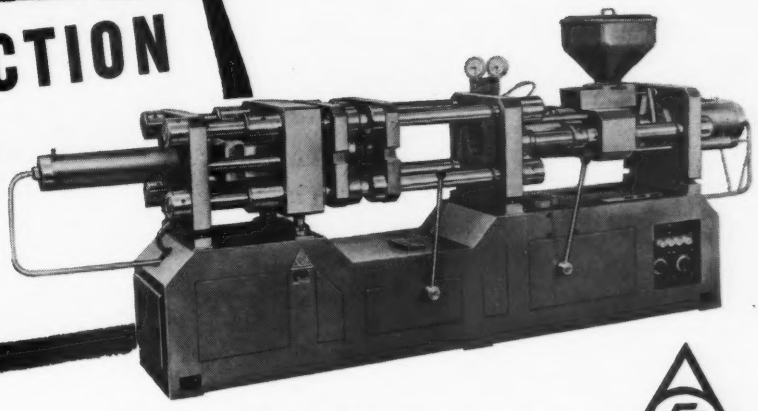

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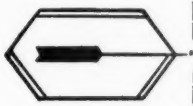

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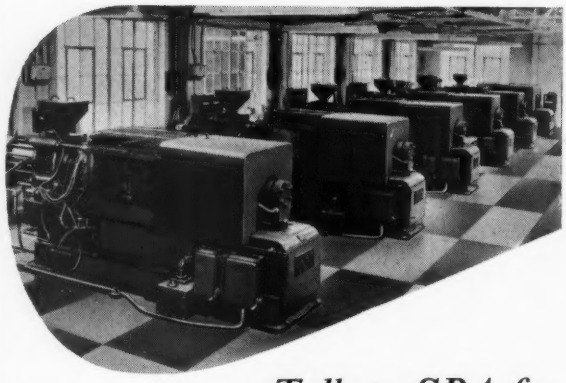

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CONTINUED IMPROVEMENT

MR. B. C. WESTALL ON GREAT STRENGTH OF EXPORT MARKET

The 59th annual general meeting of Thomas De La Rue & Co., Ltd., was held on July 25 in London.

Mr. B. C. Westall, C.B.E., M.A. (the chairman), presided, and in the course of his speech said:—The Company's trading continues to improve and this is reflected in the Balance Sheet. The General Reserve has been increased out of current profits by an allocation of £100,000. Some years ago a sum of £200,000 was set aside as a Tax Equalisation Reserve on the absorption of the Subsidiary Companies into the Parent Company. It has never been necessary to draw on this Reserve and we have now decided to transfer it to General Reserve which now stands at the substantial figure of £1,300,000. The Appropriation Account, that is to say the Carry Forward, has increased from £282,629 to £407,134.

Increase of Capital

Later in the meeting I shall ask the Stockholders to agree to increase the Authorised Capital of the Company by £1,000,000. Up to now the increases we have made to plant and machinery, and the additional turnover we have had to finance, have been furnished from our own resources. It may be that we can finance our new Australian venture similarly. That depends on its rate of development. But it is possible that our research organisation may at any time confront us with new developments which will need money to bring into the production line. For that reason, and not because we have any immediate intention of issuing more shares, I shall later ask for a resolution to be passed to increase the Authorised Capital of the Company.

Turning to the figures of Trading, I think Stockholders should know that the whole of this year's profits are attributable to the Security and Plastics Divisions.

Taking the business as a whole a half of our sales are exported directly. Apart from this, many manufactures are exported by our Customers in which our products form a part. I think our Stockholders should know that this great strength of our export market is due to the fact that in the course of each year nearly every country in the habitable parts of the globe is visited.

Divisional Activities

In the Security Division I am glad to be able to report that the forecast I made last year that the turnover would be maintained has proved well justified. During the year new customers for banknotes and stamps were obtained. The outlook for the current year I regard as no less promising than that for the year under review.

During the year a first dividend of 20% was declared by the Pakistan Security Printing Corporation. This undertaking is now in full working order and is operating most efficiently.

In the Plastics Division there has been a substantial increase in sales of both Formica and Delaron laminated plastics.

Last year Stockholders will remember I reported that the Company had reduced the price of Formica products by 10%. The hopes I then expressed that the profits would be maintained by an expansion of turnover have not only been fulfilled but, by reducing waste and making strict economies the factory has made a considerable contribution towards this increase in profits. The new 10 ft. × 4 ft. Press has been installed and is producing satisfactorily.

Another encouraging sign in this Division is the increasing success of the plastics manufacturing units on the Continent, namely, in France, Germany, Spain, and Italy, from which we may expect a reasonable contribution to the Company's profits during the current year. Since the close of the year arrangements have been made, with the fullest encouragement of the Australian Government, to erect a factory for the manufacture of our plastic products in Australia. It will be two or three years before this factory can operate profitably and until that time has arrived we shall be continuing to export to Australia, though on a diminishing scale. There is such a considerable field for us in the general export market that I am hopeful by the time the Australian factory is fully operating we shall have been able to divert our available production elsewhere.

Delaron—Steady Expansion

During the year steady progress was made in the expansion of our Delaron material, particularly in its application to telephones, radio, television, and the electronics fields. Many technical improvements have been made in the production of this material, and in addition to this, we have successfully introduced a copperclad grade of Delaron Laminate.

In the Potterton Division there was a further severe setback in the domestic cooker market due to the Credit Squeeze. To some extent the reduction in cooker sales was mitigated by our entry into the oil-fired boiler (that is to say water heater) market, although this was only on a comparatively small scale. New models are now being developed and will be marketed during the current year. It will, of course, take two to three years before we can fully develop this new product. I am glad to be able to say, however, that our first oil-fired boiler met with an excellent reception from the heating and ventilating engineers and we hope that these new products may help to put the Potterton Division on a satisfactory basis.

In the Stationers Division new models of Onoto pens were introduced but the initial cost of publicity, as we anticipated, more than absorbed the gross profits of the additional sales. Other important steps have been taken to improve the efficiency of this Division. Stockholders will, I am sure, be glad to know that the Company has once more been entrusted with the Royal Warrant for the Manufacture of Playing Cards. It is pleasant to know that we have enjoyed this great honour continuously since the early days of King William the Fourth.

During the year a considerable sum has been spent on Research and Development covering all Divisions, which we believe will make a substantial contribution to the Company's prosperity in the years to come.

The report was adopted and the increase of capital approved.

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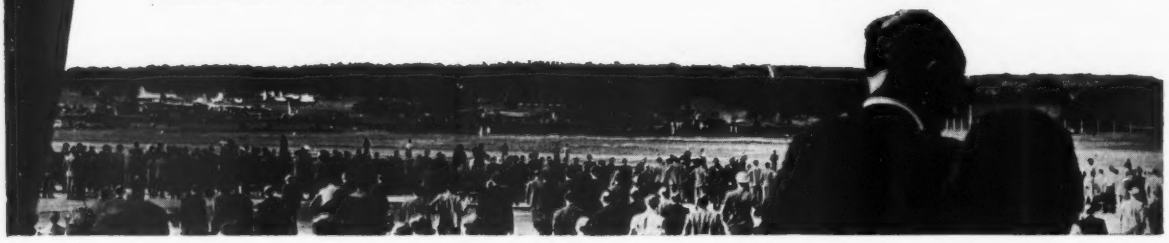

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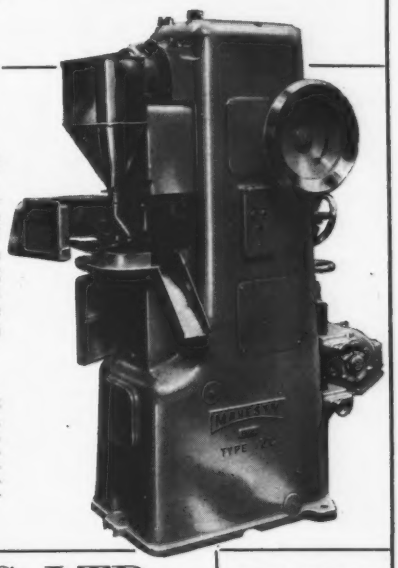

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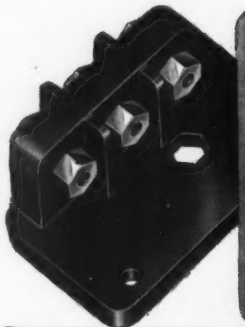

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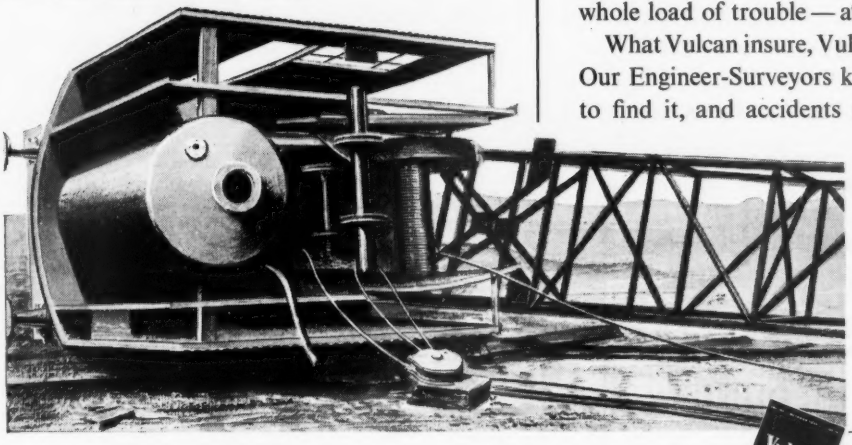

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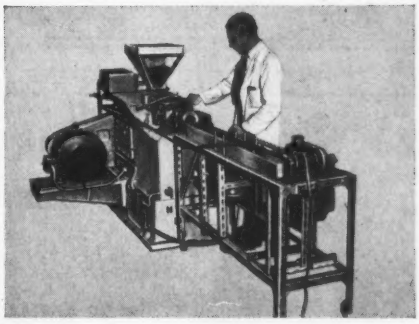

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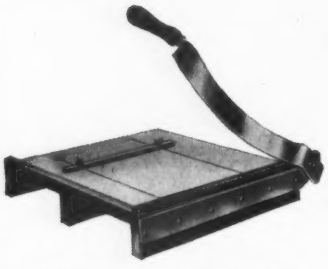

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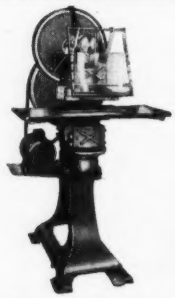

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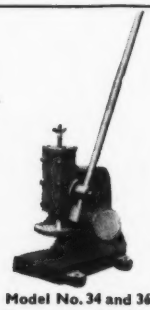

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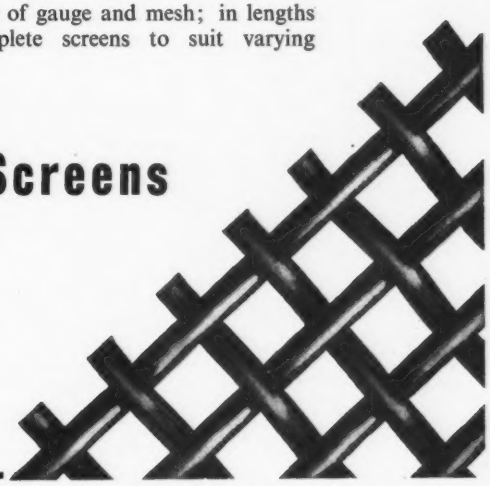

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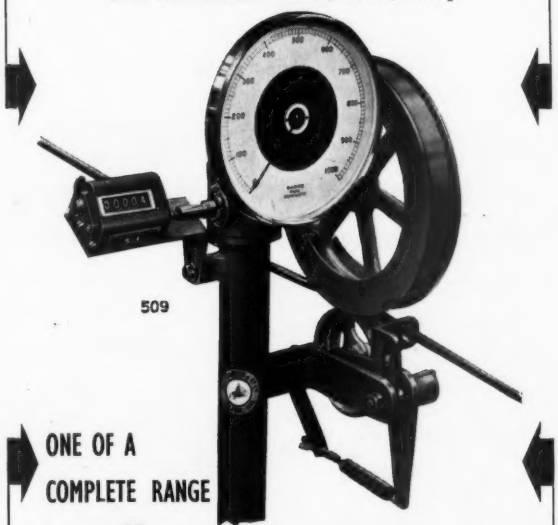

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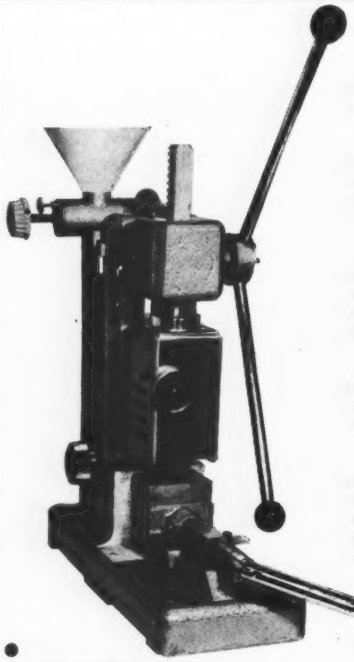

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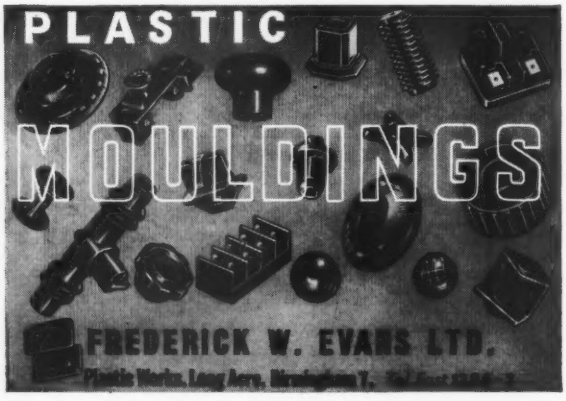

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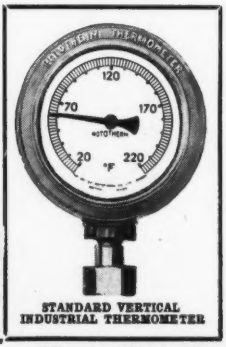

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Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES.—6d. per word (minimum 12 words 6/–). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting 2 gns. per single column inch. Series discounts of 5% for 6, and 10% for 12 consecutive insertions allowed to trade advertisers.

TERMS.—Strictly net and prepayable. Monthly accounts for settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

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BOX NUMBERS.—Private advertisers desiring to have replies sent care of "Plastics" may do so on payment of 1/– to cover booking and postage, plus cost of four extra words. To avoid mistakes in forwarding, Box numbers should be carefully and legibly copied and replies sent to Box P000, care of "Plastics," Bowling Green Lane, London, E.C.1.

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Raw Material (contd.)

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Polyethylene.
P.V.C.
Polyvinyl butyral.
Perspex and Diakon.
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POLYTHENE FILM SCRAP for disposal. Enquire Box P.2719, care of " Plastics." 227-45

PERSPEX SCRAP, large quantity. Please write Box P2720, care of " Plastics." 227-46

CELLULOSE ACETATE LUMPS, mixed colours for sale. Box P2721, care of " Plastics." 227-47

POLYSTYRENE, Reground, for sale. Box P2722, care of " Plastics." 227-48

LARGE QUANTITY of printed polythene film available. Please contact Box P1936, care of " Plastics." 227-41

AVAILABLE, 20 tons black polythene granules. Reasonable offer accepted. Box P1935, care of " Plastics." 227-40

WELWIC, White, approximately 2 tons. Box P2723, care of " Plastics." 227-49

RAW MATERIAL WANTED

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WANTED, Polythene scrap. Write to Box P221, care of " Plastics." zzz-322

DO YOU HAVE ANY PLASTIC SCRAP TO SELL? Or are you looking for some to buy? Then contact Michael St. Stevens, Ltd., Keswick Rd., S.W.15. Phone, Vandyke 3345-6. zzz-303

PROMPT CASH OFFERED for virgin and reprocessed cellulose acetate and polystyrene. Give manufacturer's name and backing. Box P873, care of " Plastics." zzz-306

P.V.C. GARMENT AND HANDBAG OFFCUTS wanted. We collect and pay cash. Brockwell Plastics, Ltd., 50 Hollingbourne Rd., S.E.24. zz-305

SURPLUS STOCKS of thermosetting and thermoplastic moulding powders wanted. Send details. Box P1727, care of " Plastics." zzz-297

NYLON SCRAP required in regular quantities. Please state grade and amount available to Box P264, care of " Plastics." 227-1223

WANTED, plastic scrap. Send samples, details, price, etc., Box P2448, care of " Plastics." 227-1229

PLASTIC FERRULES required by firm of brush manufacturers. Write Box P2711, care of " Plastics." 227-16

WANTED, clear Perspex Offcuts. $\frac{1}{8}$ in. thick in $2\frac{1}{2}$ in. wide strips or squares. Please reply to Box P2715, care of " Plastics." 227-31

POLYTHENE, natural, large quantities required for export and home, injection and film scrap. Please offer with particulars and samples to Herbert Connor Ltd., 120 Beaufort Park, London, N.W.11. 227-50

WANTED, large regular supplies of nylon scrap shaving. Hugh Kershaw, Oxenhope, Keighley. 232-5127

DIAKON ACRYLIC SCRAP. We buy large and small quantities and pay prompt cash. Send your offers immediately to J. W. Nash and Co., Ltd., 27 Beethoven St., W.10. 227-39

SITUATIONS VACANT

DESIGNER-DRAUGHTSMAN required, must have experience of compression, injection and transfer mould tools. Permanent and progressive position with small firm 30 miles from London. Golden opportunity for one with the necessary qualifications. Send full details of experience and salary required. Box P2623, care of " Plastics." 231-1231

A VACANCY occurs for Injection Moulding Department Foreman in North London. Good salary and excellent conditions for experienced man. Box P265, care of " Plastics." 227-1224

AN EXPERIENCED MAN required, capable of taking charge of a small compression moulding shop. Within 40 miles of London. Well-paid and permanent position. Write stating full details of experience. Box P2220, care of " Plastics." 227-43

VACUUM FORMING.
Representative required calling on industrial users. Apply Box P2612, care of " Plastics." 227-34

REPRESENTATIVE required by trade moulders for London and S.E. Experienced in selling small injection mouldings. Knowledge of mould design and estimating. W. H. Adamson Plastics Ltd., Hedley St., Maidstone. 227-38

ASSISTANT SALES MANAGER required for subsidiary company of large group in London. Initially expected to run internal sales office but will acquire growing responsibility for outside representation. Prime qualification is knowledge of systems and procedures. Position would suit applicants with a background of accounting or production, as well as those with sales experience. Arts or Science Degrees and knowledge of plastics would be useful but not essential. Age 25–35. Starting salary £800 to £1,000 p.a. according to experience. Box P271, care of " Plastics." 227-13

B.X. PLASTICS, LTD., Brantham Works, near Manningtree, Essex, require a Chemist to take charge of a Control Laboratory covering the production of Nitrocellulose. Experience in cellulose chemistry would be very helpful, but is not necessary. Applications stating age, qualifications and experience, should be addressed to the Personnel Manager, B.X. Plastics, Ltd., Brantham Works, near Manningreee, Essex. 228-5119

CHEMIST, ENGINEER or CHEMICAL ENGINEER required to do development work on plastics extrusion processes. Good honours degree or equivalent an advantage but man with suitable practical experience would not be ruled out. Previous experience on extrusion processes desirable but not essential. Excellent salary and staff conditions. For married men in approved cases assistance in meeting removal expenses will be available. Factory is located near a selection of attractive residential areas. Apply Box P272, care of " Plastics." 227-12

DEPARTMENTAL MANAGER required for Plastics Company in London. High remuneration will be given to capable man with wide experience. Write to: Managing Director, Box P273, care of " Plastics." 227-11

PRODUCTION MANAGER required with experience in the processing of thermoplastics such as P.V.C. and Polythene. Apply giving particulars of technical education and works experience to The Managing Director, Stanley Smith & Co., Worple Road, Isleworth, Middlesex. 227-5

SENIOR METHODS AND WORKS STUDY ENGINEER required to take complete control of existing Works Study Department. Candidates should have a minimum of five years experience or have held a similar post and preference will be given to those with knowledge of Rubber and/or Plastics manufacture. The post is permanent, superannuable and offers wide scope for a man of proved ability. Salary commensurate with experience but not less than £1,000 per annum. Applications with details of age, experience, previous posts, etc., and with the words " Works Study Engineer " endorsed on the envelope, should be addressed to The Chairman, Rubber Improvement Ltd., Rilex Works, Wellingborough, Northants. 227-3

THE CHEMISTRY OF AIRCRAFT DESIGN
Bristol Aircraft, Ltd., have a group studying the properties of adhesives and reinforced plastics in relation to design problems of airframe structures.
A chemist is needed to guide and control the investigations. Needless to say, he must be an experienced scientist with the appropriate qualifications.
If you are interested, write to:
Mr. P. A. TOBIN,
BRISTOL AIRCRAFT, LTD.,
FILTON HOUSE, FILTON, BRISTOL 227-2

Situations Vacant (contd.)

TECHNICAL REPRESENTATIVE is required by the Chemical Division of B.X. Plastics, Ltd., to initiate a sales development programme on a new project. A degree in chemistry is essential and sales experience, particularly in the paint trade, desirable. The successful candidate will be based at Brantham and will be expected to travel widely in the United Kingdom. Applications stating age, qualifications and experience, should be sent to The Personnel Manager, B.X. Plastics, Ltd., Brantham Works, near Manningtree, Essex. 228-5121

THE WEDNESBURY TUBE CO., LTD., Bilston, Staffordshire, require the services of a versatile man, between 28 and 35 years of age, to deal with the commercial and sales office for Polythene Tubing and any other kindred developments. Preferable for applicant to have some technical knowledge but must have previous commercial experience. Applications to be addressed to The Managing Director, marked " Private—Ref. P/D." 227-8

TURNER BROTHERS ASBESTOS CO., LTD., Leigh Road, Hindley Green, near Wigan, Lancs., have a vacancy for a Design Engineer. Duties will include the design of components and moulding tools for the development and production of laminated plastics. This is an opportunity to join a progressive organisation in a position affording varied and interesting work with excellent prospects of advancement. Pension scheme. Five-day week. Excellent welfare facilities. Salary according to qualifications and experience. Apply initially in writing to Personnel Officer. 227-7

TURNER BROTHERS ASBESTOS COMPANY LIMITED, Leigh Rd., Hindley Green, Near Wigan, Lancs., have a vacancy for a Technical Assistant in the Plastics Production Department. Duties will include the development and process control of low pressure moulded laminates. Applicants should be Associates of the Plastics Institute, or possess an engineering qualification together with experience in the plastics industry. This is an opportunity to join a progressive organisation in a position affording varied and interesting work with excellent prospects of advancement. Pension scheme. Five-day week. Excellent welfare facilities. Salary according to qualifications and experience. Apply initially in writing to Personnel Officer. 227-27

THE TELEGRAPH CONSTRUCTION & MAINTENANCE CO. LTD., cable manufacturers, require a Research Assistant, preferably with experience in plastics work, e.g. the processing and extrusion of polythene, polyvinylchloride and other thermoplastics. Inter-B.Sc. degree or equivalent. Opportunities exist for further education and advancement. All posts pensionable. Five-day week and all welfare facilities. Write details to: Personnel Manager, Telcon Works, Greenwich, S.E.10. 227-26

EXPERIENCED REPRESENTATIVE wanted to promote sales of Vacuum Formed articles. Apply The General Celluloid Co. Ltd., 206, Hanworth Rd., Hounslow, Middlesex. 227-25

PLASTIC PRINTS. Experienced Textile Designer seeks free-lance commissions. Elizabeth Gould, 41 Ashburton Rd., Ruislip, Middx. RUI 7285. 227-24

ASSISTANT TO DEVELOPMENT DIRECTOR
Applicants must have good knowledge and experience of plastic products, calendering and spreading techniques. Knowledge of costing and estimating an advantage. Position may necessitate travelling in United Kingdom and abroad. Knowledge of foreign language will be of advantage. Age limit 40 years.
Please write in confidence giving age, full details of education, experience and qualifications to the Managing Director, The Marley Tile Co., Riverhead, Sevenoaks, Kent. Only applicants selected for interview will be notified. 227-36

DE HAVILLAND PROPELLERS LTD., STEVENAGE, HERTS.

As a result of an extending programme of Development this Company has, from time to time, higher grade vacancies available in its Development and Research Depts., which are now established in modern premises at Stevenage.

At present we invite applications for the post of
SENIOR PLASTICS TECHNICIAN.

The successful applicant will be required to work in a Department engaged upon developing a wide range of Plastics Applications for Aircraft Components and Guided Missiles. After an initial Trial Period he will be made responsible for the Experimental section of the Department.

Applicants should have a minimum of 2 years industrial experience and should possess a university degree in Aircraft Engineering, although equivalent qualifications would be considered.

HOUSING ACCOMMODATION will be made available in appropriate cases.

Please write, giving full details and quoting reference P.P.I. to: The Personnel Manager. 227-55

Situations Vacant (contd.)

PRODUCTION MANAGER to join the staff of one of the leading plastic manufacturers in the country, situated near Darlington. Must have an engineering background and considerable experience of senior management on the technical side of a similar organization engaged in injection moulding. The position, which is pensionable, involves the supervision of all production from tool-making and injection moulding to the assembly and packing of a large variety of plastic toys and housewares. Applicants should be between the ages 30–45, with common sense and the ability to control staff. Apply O. & M. Kleemann Ltd., West Halkin House, West Halkin St., London, S.W.1. 227-23

MOULDMAKERS REQUIRED. Highest rates of pay for really good men. Chudleigh, Heathman's Yard, Parsons Green, S.W.6. Renown 1370. 227-22

GENERAL MANAGER required P.V.C. and Polythene factory London area, capable taking complete charge. Good salary, excellent prospects. Assistance in house purchase if necessary. Apply full details Box P2729, care of " Plastics." 228-5133

VINYL PRODUCTS LTD. require for their P.V.C. laboratories young men of Inter B.Sc., or equivalent, for development work on P.V.C. compounds and pastes. Previous suitable experience on P.V.C. will be considered in lieu of qualifications. The appointments, which are in an expanding department, are progressive and pensionable. Successful applicants will be given facilities for part-time study. A vacancy also exists for a young man with previous laboratory experience, not necessarily on P.V.C. Applications in writing in first instance to Vinyl Products Ltd., Butter Hill, Carshalton, Surrey. 228-5132

SALESMEN required to carry additional line, preference to one representing a P.V.C. Moulding Powder manufacturer. Replies will be treated in strict confidence, and line offered can in no way compete with existing lines. We are not material suppliers. Box P2718, care of " Plastics." 227-29

Situations Vacant (contd.)

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LARGE INDUSTRIAL GROUP
WITH INTERESTS IN THE
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ONLY APPLICANTS SELECTED FOR INTERVIEW WILL BE NOTIFIED.

Applications in confidence, giving age, education, experience, salaries earned and salary required, to Box P2450, care of " Plastics." 227-35

SITUATIONS WANTED

SALESMAN. Thorough knowledge of Plastic materials, speciality Polythene; 5 years Plastics Industry. At present Assistant to Sales Director, requires change with scope for advancement. Box P2717, care of " Plastics." 227-28

TIME RECORDERS

FACTORY TIME RECORDERS. Service rental. Phone, Hop 2239. Time Recorder Supply and Maintenance Co., Ltd., 157–158 Borough High St., S.E.1. 233-1190

BOOKS AND PUBLICATIONS

MOULDS FOR PLASTICS, by W. M. Halliday. Meets the needs of both mould designer and toolmaker. Discusses design, construction, operation and maintenance problems in the light of practical experience. Illustrated. 286 pages, 30s. net from booksellers, or 30s. 10d. by post from the publishers, Temple Press, Ltd., Bowling Green Lane, London, E.C.1. zzz

PLASTICS, SCIENTIFIC AND TECHNOLOGICAL (3rd Edition), by H. R. Fleck. A recognized standard work on the chemistry and technology of plastics. Illustrated. 400 pages, 40s. net from booksellers, or 41s. 3d. by post from the publishers, Temple Press, Ltd., Bowling Green Lane, London, E.C.1. zzz

CELLULOSE ACETATE PLASTICS, by Vivian Stannett. A complete technical survey of one of the most popular and adaptable products of the plastics industry. Illustrated, 284 pages, 30s. net from booksellers or 31s. by post from the publishers, Temple Press, Ltd., Bowling Green Lane, London, E.C.1. zzz

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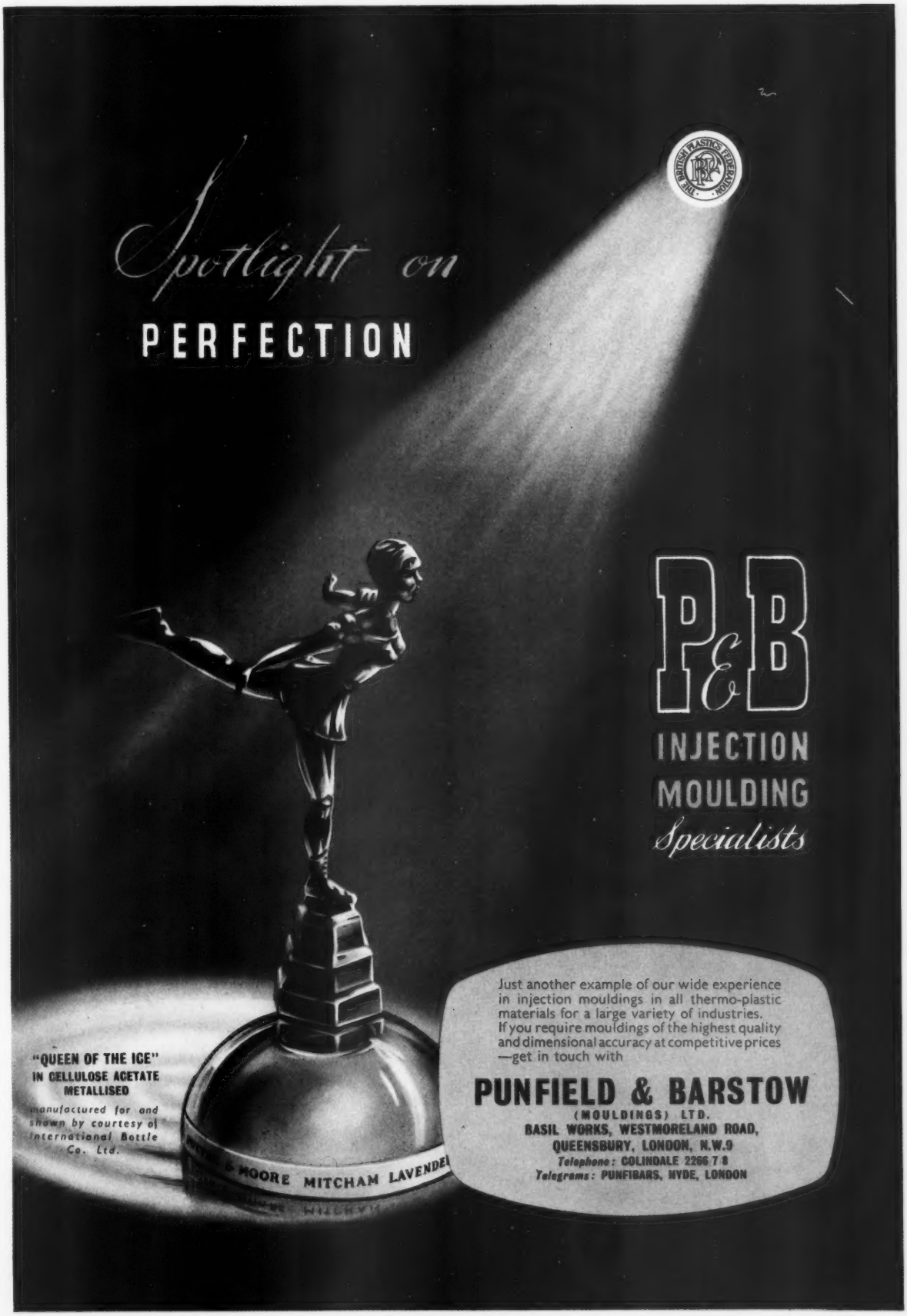
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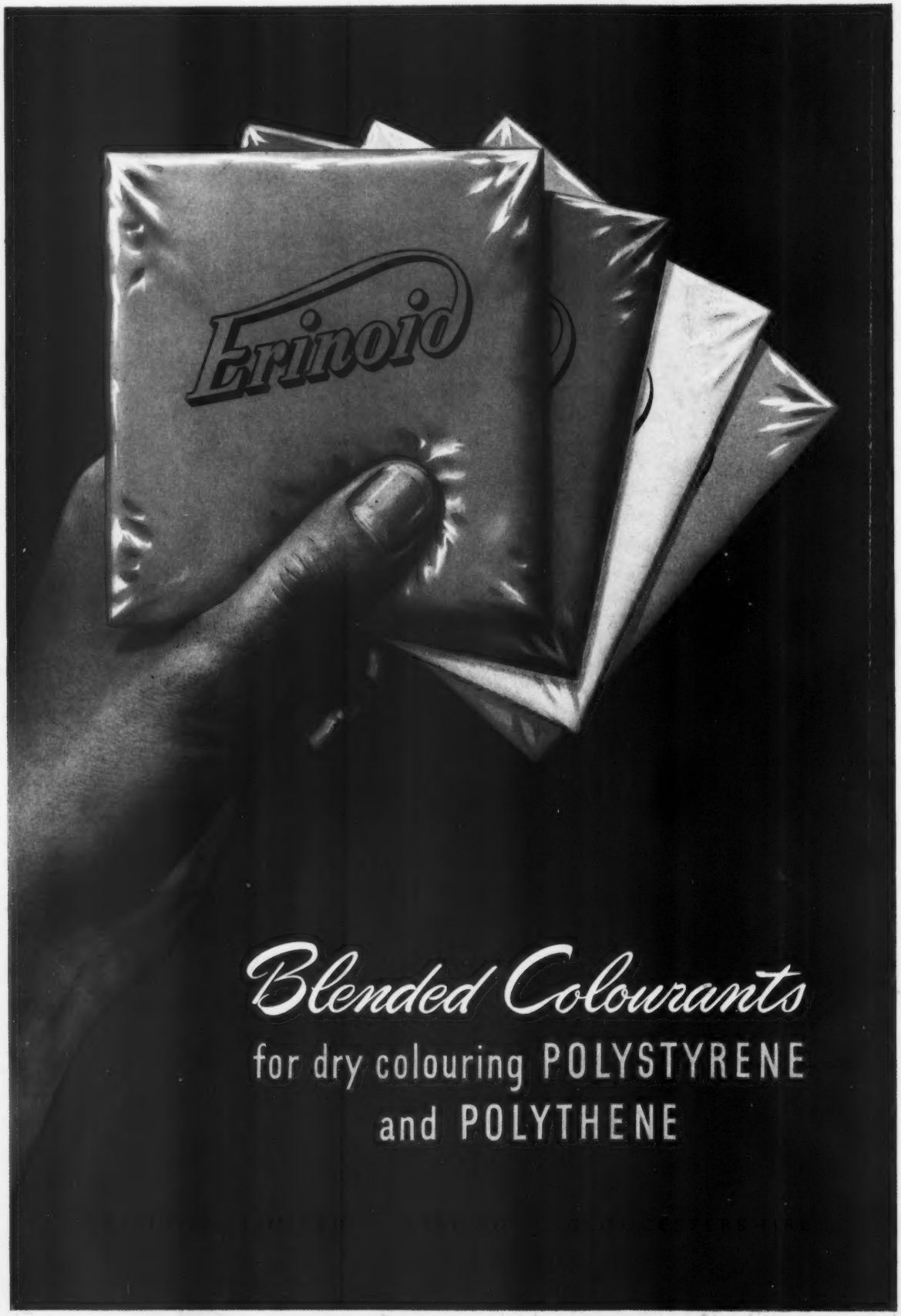
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